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DOE/NASA WIND TURBINE DATA ACQUISITION SYSTEM PART IV: OPERATIONS AND MAINTENANCE MANUAL (PLUMBROOK STATION)

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prepared for

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1.0 PREVENTIVE MAINTENANCE

1.1 Daily Preventive Maintenance

1.1.1 Clean tape heads on Analog Sabre III, Analog Sabre VII and Digital DEC Mag tape recorders prior to first usage of the day and between tape changes as described.

A. Turn off power to recorders.
B. Open front panel access doors.
C. Using tape head cleaner and cotton swabs, clean tape heads and path on recorders.
D. Place new tapes on recorders and feed tape through to takeup reels as displayed on the diagram on the front panel of tape recorders. (Refer to Recorder Operations, Sections 4.2 and 4.3)
E. Turn takeup reels manually clockwise until about 3 feet of tape is on takeup reels.
F. Turn power on to both recorders.
G. On analog tape recorder, press the stop button until tension is placed on the tape.
H. On digital tape recorder, press the LOAD button 1 time.
I. Close front panel access doors on recorders.

Note: For more details, refer to the respective maintenance manual

1.2 Weekly Preventive Maintenance

1.2.1 Clean Digital Dec Mag tape recorder vacuum chamber with denatured alcohol as follows:

A. Turn power off to recorder.
B. Open front panel access door by turning 2 screws holding access door, and open door.
C. Using cotton swabs, clean the inside of the vacuum chamber and access door with alcohol. Be sure to clean all vacuum holes thoroughly.
D. Close vacuum chamber access door by turning 2 screws holding latches on the door until they lock.
E. Place new tape on recorder as defined in Section 4.2.

1.2.2 Clean the RK05 Disk Drive upper and lower disk heads with denatured ethyl alcohol and cotton swabs as follows:

A. Place the RUN/LOAD front panel switch in the LOAD position.
B. When the front panel LOAD light comes on, open disk drive access door and remove disk pack.
C. Close access door.
D. Depress the CNTRL and HALT switches on the PDP 11/34 front panel simultaneously.
E. Turn the PDP 11/34 computer power switch to the off position.
F. Slide the disk drive out of the rack to gain access to top cover.
G. Loosen top and side holding screws on the top cover and remove.
H. With alcohol and cotton swabs, clean upper and lower disk heads.
I. Replace top cover and tighten holding screws.
J. Slide disk drive into rack.
K. Turn the PDP 11/34 computer power switch to the on position.
L. Open access door to the disk drive and insert disk pack.
M. Place the RUN/LOAD front panel switch to the RUN position.

1.2.3 Perform System Verification, Section 3.0.

Note: Be sure to complete the Weekly Maintenance Log.

1.2.4 Weekly Preventive Maintenance Log

Month of ______________________

Date ______________ Operator ____________________

A. DEC MAG Tape Recorder Cleaned ______________ (check)

B. RK05 Disk Drive Heads Cleaned ______________ (check)

C. System Verified Operational ______________ (check)

Date ______________ Operator ____________________

A. DEC MAG Tape Recorder Cleaned ______________ (check)

B. RK05 Disk Drive Heads Cleaned ______________ (check)

C. System Verified Operational ______________ (check)

Date ______________ Operator ____________________

A. DEC MAG Tape Recorder Cleaned ______________ (check)

B. RK05 Disk Drive Heads Cleaned ______________ (check)

C. System Verified Operational ______________ (check)

Date ______________ Operator ____________________

A. DEC MAG Tape Recorder Cleaned ______________ (check)

B. RK05 Disk Drive Heads Cleaned ______________ (check)

C. System Verified Operational ______________ (check)

Date ______________ Operator ____________________

A. DEC MAG Tape Recorder Cleaned ______________ (check)

B. RK05 Disk Drive Heads Cleaned ______________ (check)

C. System Verified Operational ______________ (check)

Date ______________ Operational ____________________

A. DEC MAG Tape Recorder Cleaned ______________ (check)

B. RK05 Disk Drive Heads Cleaned ______________ (check)

C. System Verified Operational ______________ (check)

1.3 Creating System Backups

1.3.1 Procedure to create System Backup Disks (DK0 and DK1)

A. Load a scratch formatted disk into disk drive DK2.

B. Boot up DK0 by the following:

(1) Place the Disk 0/1 front panel RUN/LOAD switch to the RUN position.

(2) On the PDP 11/34 front panel:

a) Press the CNTRL and HALT switches simultaneously.

b) Press the CNTRL and BOOT switches simultaneously.

Keyboard Operations - the operator's terminal responds as follows:

Note: Operator input is designated by underline.

```
004360 151726 001036 012040
$DK
DEVICE TT01:  NOT IN CONFIGURATION
 RSX-11M V3.1 BL22  64K   MAPPED
RED DK0:=SY0:
RED DK0:=LB0:
MOU DK0:SYSTEM
@(1,2)STARTUP
* PLEASE ENTER TIME AND DATE (HR:MN DD-MM-YY) (S): 04-MAY-81
TIM 04-MAY-81
ACS SY0:/BLKS=200
* DO YOU WISH TO RUN TELEVENT? (Y/N):N
```

c) By entering the following command strings, the operator will create backup disks of DK0 and DK1.

1-	BOO (1,54)DSCSYS	This boots up program DSCSYS.
2-	DK1:/UNIT=2	Program doesn't recognize Disk 2. This command assigns DK1 to Unit 2 (DK2).
3-	DK1:/VE=DK0	Stores DK0 onto DK1 (reassigned to DK2).
4-	Remove Disk from DK2, label and date.	
5-	Install another scratch formatted Disk into DK2.	
6-	DK0:/UNIT=2	Assigns DK0 to Unit 2 (DK2).
7-	DK1:/UNIT=1	Assigns DK1 to Unit 1.
8-	DK0:/VE=DK1:	Stores DK1 onto DK0 (reassigned to DK2).
9-	Remove Disk from DK2, label and date.	

1.3.2 Procedure to Copy Backup Disks Back Onto DK0 and DK1

A. Load DK0 backup disk into disk drive DK2.

B. Boot up DK0 (refer to Section 1.3.1 b).

C. By entering the following command strings, the operator will copy the backup DK0 and DK1 disks onto DK0 and DK1.

Note: Operator input is designated by underline.

D. Write Protect the Original Disk (Depress WTPROT switch).

1.	BOO (1,54)DSCSYS	This boots program DSCSYS.
2.	DK1:/UNIT=2	Assigns DK1 to Unit 2.
3.	DK0:=DK1:	Loads DK0 from backup DK0.
4.	Remove DK0 backup disk from DK2 and store.	
5.	Load DK1 backup into disk drive DK2.	
6.	DK1:/UNIT=1	Assigns DK1 to Unit 1.
7.	DK0:/UNIT=2	Assigns DK0 to Unit 2.
8.	DK1:=DK0:	Loads DK1 from backup DK1.
9.	Remove DK1 backup disk and store.	

1.3.3 Procedure to Transfer Files from Disk to Disk

A. Boot up system.
B. Load Disk to obtain files from (or transfer to).
C. Type: >MOU DK2:/OUR - this mounts DK2
D. Type: >PIP <CR> - this puts terminal in PIP mode.
E. To transfer all files in a given UIC (user ID code), use the following format:
   PIP> DK2:(30,1)/UF=DK0:(30,1)*.*;*
   Note: /UF creates UIC if that UIC doesn't exist.
   This transfers from DK0 all files in UIC (30,1) to DK2 UIC (30,1).
F. To transfer a file(s) in a UIC, use the following format:
   PIP> DK2:(30,1)=DK0:(30,1)MOD0.PB2;11
   This transfers from DK0 the file MOD0.PB2;11 to DK2 (30,1).

2.0 Calibration Procedures

2.1 Calibration of Tape Speed Compensation

2.1.1 Using a Frequency Synthesizer apply a 10m volts RMS signal to the input patch panel FM Mux input.

2.1.2 Place TSC switch on, set frequency to 9.5 khz and adjust BAL control for 0.00 $\pm$ 0.020 volts.

2.1.3 Set frequency to 9.785 kHz (+3%) and adjust band edge voltage (BEV) for $\pm$4.000 $\pm$ .020 volts.

2.1.4 Change frequency to 9.215 kHz (-3%) and verify output is -4.00 volts.

2.1.5 Repeat steps 2.1.1 - 2.1.4 for each FM Detranslator.

2.2 Mod 0 Discriminator Calibration (Realtime)

2.2.1 Install Mod 0.PB (or current) patchboard. Take note on how FM signals are patched.

NOTE: FM patching information can be found in the Plumbrook Site Manual under Patchboard Information.

2.2.2 Patch FM Calibrator output (PP 31,32) to the AMP/DELAY Inputs 1 through 4 located at coordinates (B,C,D,E 31,32).

2.2.3 Verify that all discriminators lock up with signal. Note that zero signal (yellow) lamp on 4130 Detranslators goes out.

2.2.4 Turn all TSC switches to off position.

2.2.5 Place the FM calibrator switch to center frequency. (CF)

2.2.6 With a digital voltmeter monitoring the output of each EMR 4167 and 4150 discriminator, adjust the balance control for 00.00 $\pm$ 0.005 volts. Check off on data sheet.

2.2.7 Place the FM calibrator switch to upper band edge. (UBE) Adjust the BEV pot on each discriminator for +5.000 volts. Check off on data sheet.

2.2.8 Patch each mux back to its respective location.

NOTE: Refer to current FM patching information found in Plumbrook Site Manual under Patchboard Information.

Date _____ Operator _____

Daily P.M. and Calibration

Tape Heads Cleaned (check) _____

Discr Ch #	CF (±0.020)	LBE (±0.020)	UBE (±0.020)
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			

Discr Ch #	CF (±0.020)	LBE (±0.020)	UBE (±0.020)
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
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56			
57			

2.3 Remote Site Discriminator Calibration (Playback)

2.3.1 Install desired patchboard into system.
Note: A listing of available patchboards can be found in Section 7.4.

2.3.2 Patch FM Calibrator output (PP 31,32) to AMP/DELAY inputs 1 through 4 located at (B,C,D,E,31,32).

2.3.3 Verify that all discriminators lock up with signal. Note that zero signal (yellow) lamp on the 4130 Detranslators goes out.

2.3.4 Turn off <u>all</u> TSC switches.

2.3.5 Place the FM calibrator switch to (CF) center frequency.

2.3.6 With a digital voltmeter monitoring the output of each EMR 4167 and 4150 discriminator, adjust the balance control for 00.00 ± 0.005 volts. Check off on data sheet.

2.3.7 Place the FM calibrator switch to (UBE) upper band edge. Adjust the BEV pot on each discriminator for +5.000 volts. Check off on data sheet.

2.3.8 Patch desired recorder track to its desired Detranslator input.
Note: Refer to FM patching (playback) information found in the Remote Site manual under Patchboard Information.

2.3.9 Load remote site analog tape. Using the cal signals recorded onto the beginning of the FM tape from the remote site, make adjustments to the discriminators as necessary.
Note: Individual sensor calibration information is available on the respective sensor sheets located in the respective site manual.

2.4 Brush Recorder Calibration
There are two (2) ways of calibrating the brush recorders.

2.4.1 A. Patch the discriminator outputs to the desired brush channel.
B. Patch the FM calibrator output to the discriminator inputs.
C. Place the FM calibrator switch to (CF) center frequency. Adjust the brush pen position as desired.
D. Place the FM calibrator switch to the desired band edge and adjust brush sensitivity as desired.

-or-

2.4.2 A. Use a voltage source and patch directly to the brush channel input.
B. Apply known voltage for the lower limits. For zeroing, adjust the pen position as desired.
C. Apply known voltage for the upper limits. For gain, adjust the sensitivity as desired.
Note: NASA personnel takes care of Mod 0 brush calibration.

2.5 Omnitek VCO Calibration

2.5.1 Required Test Equipment
A. Digital Voltmeter
B. 0 - 5 Volt Voltage Source
C. Frequency Counter

2.5.2 Preliminary Operations
A. Install Plumbrook Calibration Patchboard into system.
B. Connect 0 - 5 volt voltage source to patch panel where marked VCO input (1 AA, 1 B8).

2.5.3 VCO Calibration with a zero volts offset.
A. Set voltage source to 0.00 volts.
B. While monitoring the VCO Frequency Output (test point on VCO) with a frequency counter, adjust the frequency (FR) potentiometer to give an output frequency equal to the VCO center frequency that is marked on the VCO.
C. Set the voltage source to 5.0 volts. The output frequency should be equal to the VCO center frequency plus 125 Hz. (Ex. If the VCO is marked 1.0 kHz then the output frequency should be 1.125 kHz).
Note: The band width (BW) pot may need adjustment.
D. Set the voltage source to -5.0 volts. The output frequency should be equal to the VCO center frequency minus 125 Hz.

2.5.4 VCO Calibration with 2.5 volt offset.
A. Set voltage source to 2.5 volts.
B. While monitoring the VCO Frequency Output (test point on the VCO) with a frequency counter, adjust the frequency potentiometer to give an output frequency equal to the VCO center frequency that is marked on the VCO.
C. Set the voltage source to 0 volts. The output frequency should be equal to the VCO center frequency minus 125 Hz.
Note: The band width pot may need a slight adjustment.
D. Set the voltage source to [illegible] volts. The output frequency should be equal to the VCO center frequency plus 125 Hz.

2.5.5 Repeat the appropriate steps for the remainder of the VCO's in the system.

2.6 Sabre Recorder Calibration

2.6.1 Required Test Equipment
A. 0 - 10 Volt Voltage Source
B. Wavetek Frequency Generator or equivalent
C. Frequency Counter
D. Digital Voltmeter

2.6.2 Preliminary Operations
A. List signals and their expected voltage range.
B. Determine which recorder tracks need to be calibrated.
C. Determine type of record amplifier needed for each signal.
Note: A multiplex signal should be recorded with a direct record amplifier while a direct signal should be recorded with an FM Record Amplifier.

D. Set up recorder using the above information as a basis; plugging the proper record and reproduce amplifiers into the proper track locations.
E. Determine at what speed data is to be recorded.
F. Load a tape on the recorder using the diagram on the recorder as a guide.

2.6.3 Record Amplifier Calibration

A. FM Record
(1) Place RANGE/TEST switch to TEST.
(2) Place recorder in RECORD mode by pressing FWD and RECORD simultaneously (both lights should remain lit).
(3) Monitor the record signal between TP3 (CAR) and Grnd on the front of the record amplifier with a frequency counter.
(4) Depending on the chosen speed and the type of tape (Intermediate or Wide Band) adjust the CF pot on the front panel to the desired center frequency (refer to the Tape Speed and Frequency tables in the Sabre VII manual under the System Checkout and Calibration Section, page 6-12). (Ex. Center frequency for Intermediate Band tape at a tape speed of 7½ IPS is 13.5 kHz).
(5) Depending on what the full scale input voltage is to be, select the desired voltage range with the RANGE/TEST switch.
(6) Apply full scale voltage to input of the Record Amplifier.
(7) Adjust the "in" pot for Upper Band Edge (UBE) frequency which is determined by the type of tape and tape speed. (Refer to Sabre VII Manual page 6-12).

B. FM Record Playback
(1) After the Record Amplifier has been calibrated, ensure tape is still in the RECORD mode.
(2) Ensure full scale signal is applied to input of the Record Amplifier.
(3) Monitor the appropriate track Reproduce Amplifier output (front panel) with a voltmeter.
(4) Adjust the repoduce output for desired output voltage (maximum approximately 4 volts).

C. Direct Record
(1) Place RANGE switch on front panel of direct Record Amplifier to desired range. (This range should have been determined previously. See Step 2.6.2.a)
(2) Connect the wavetek with a known RMS signal to the desired track input.
(3) Place recorder in the RECORD mode.
(4) Monitor the Record Amplifier record level with a meter or oscilloscope.

D. Direct Record Playback
(1) After the direct Record Amplifier has been calibrated, ensure that the tape is still in the RECORD mode.
(2) Ensure the signal is applied to the input of the Record Amplifier.
(3) Monitor the appropriate track Reproduce Amplifier output with an oscilloscope.
(4) Adjust the reproduce output for approximately 3 - 4 volts p - p.

2.7 RMU Calibration

2.7.1 When RMU Calibration should be performed:
- A. As needed
- B. After repairs to equipment
- C. Monthly

2.7.2 Required Test Equipment
- A. Portable (battery operated) Digital Voltmeter
- B. Signal Conditioner Extender Card
- C. Input Shorting Plug
- D. Local Calibration Control Switch Box
- E. Signal Conditioner Card Puller

2.7.3 Preliminary Operations
- A. Ensure proper gain, offset, and calibration resistors are installed in signal conditioner amplifier cards as specified by NASA.
- B. Allow system to stabilize (8 - 12 hours under power).
- C. Remove cable from connector J9 of RMU and connect local calibration control switch box.
- D. Pull appropriate VCO card for inputs to be calibrated and place on extender card. Inputs from SCA cards may be monitored as follows:

Input #	VCO Pin #
1	J
2	H
3	K
4	L

2.7.4 376-02 Calibration
- A. Check .10 V excitation on pins R and S. Adjust R38 for 10.00 volts.
- B. Put input shorting connector on appropriate signal input connector. While monitoring amplifier output, trim the balance pot R7 for an output as near zero as possible.
- C. Remove input shorting plug. Connect dummy bridge on data inputs. Adjust gain pot R27 for an output of -2.00 volts of Lo Cal and +2.00 volts in Hi Cal position of Cal control.
- D. Connect data channels back to input. Adjust balance pot R17 for 0.00 volts output when in data position and $\pm$2.00 volts in Hi and Lo Cal positions. Record.

2.7.5 377-02 SCA Calibration
- A. With input shorting plug on input connectors, adjust R2 balance pot so amplifier output equals 0.00.
- B. Reconnect data input connectors.
- C. While monitoring output of S.C.A., trim balance pot R2 to 0.00 volts while Lo Cal cal control switch is in Lo Cal position. While in Hi Cal, adjust R18 gain pot for 2.50 volts. Record.

  Note: This (Hi and Lo Cal setting) may vary depending on offset put into a particular channel. Refer to Plumbrook RMU sensor sheets for calibration voltages.

2.8 600 PCM DAS Calibration

2.8.1 Required Test Equipment

A. Patchboard with all ADC channel inputs patched to a common source.
B. Voltage Standard
C. DVM HP 3455A or equivalent
D. RT-11 DIAG

2.8.2 Do the following to set up the 714 as a decom.

A. Install RT-11 disk in drive 2, spin it up and protect (turn drive 0/1 to load) disk by engaging WTPRDT.
B. Push CNTRL and HALT/SS switches simultaneously.
C. Push CNTRL and BOOT switches simultaneously.
D. Responses required on the terminal are underlined. The channel number must be typed in octal.

```
064314 000024 001016 004076
$DK2
RT-11SJ     V03B-00C
?KMON-F-Command file not found

.RUN ENCHV
INPUT CHANNEL NUMBER
1
INPUT CHANNEL NUMBER
```

At this point the Address display on the 714 will display the channel number in octal and the Data display will contain the data in octal.

2.8.3 ADC Channel Calibration & Verification

A. With patchboard in, voltage standard driving all DAS input channels, and DVM monitoring the voltage standard, set the following voltages and verify correct data. Adjust, if necessary, the pots on the 681 board. Data should be at the two numbers half the time.

Voltage	Data	Pot
-4.99145 V	003/4	R15
+4.99145 V	7773/4	R14

Repeat back and forth until no adjustment is necessary.

B. Check the following table for accuracy. The data should be ±1 count.

Volts	Data
-5.00000	0
-4.99756	1
-4.99512	2
-4.90023	4
-4.98046	10
-4.96093	20
-4.92185	40
-4.84371	100
-4.68742	200
-4.37485	400
-3.74969	1000
-2.49939	2000
.00122	4000

This verifies all bits are operating properly and the data is accurate.

2.8.4 Using FM discriminators patched to all inputs, verify each channel is working correctly by using FM calibrator one channel at a time. Change from SEQ to LBE thru VBE and back to SEQ. Verify data displayed on 714 is correct. (This needs to be rewritten when patchboard is done).

2.9 Force Card Calibration

2.9.1 Set a function generator with offset capability to sine wave 5 V P-P no offset. Insert signal to FORCE IN input on patchboard (22, 33, 34).

2.9.2 Attach dual trace scope with both inputs set the same and on DC. Verify TP7 is approximately midway between positive and negative excursions of TP6.

2.9.3 Change offset on generator and verify TP7 slowly responds to changes at TP6.

2.9.4 Monitor and sync on TP14 and monitor TP6. Verify TP14 occurs on only the rising or falling part of sine wave.

2.9.5 Change S1 on Force Card and verify the slope that TP14 occurs on is changed. Leave switch in position required for Plumbrook site.

3.0 System Verification

3.1 System Diagnostic Initialization

3.1.1 Place desired diagnostic disk pack into disk drive #2 (RK05J).

3.1.2 Place front panel RUN/LOAD switch to RUN position.

3.1.3 On PDP 11/34 front panel:
A. Press CNTRL and HALT buttons simultaneously.
B. Press CNTRL and BOOT buttons simultaneously.

3.1.4 Keyboard will respond with the following (operator input is noted by underline).

```
064214 000024 001016 004076
$DK2
CLEARING MEMORY
CHMDKA0 XXDP+ DK MONITOR 28K
BOOTED VIA UNIT 2
ENTER DATE (DD-MM-YY):  18-MAY-81
RESTART ADDR:153726
50 HZ? N  N
LSI?   N  N
THIS IS XXDP+.  TYPE  "H" OR "H/L" FOR DETAILS
.R ZQMC?? *
```

* At this point you enter the diagnostic you wish the system to run.

3.2 System Diagnostics

3.2.1 The following diagnostics should be run for a complete checkout of the digital portion of the system. Load the appropriate disk for chosen diagnostic. Initialize the system (refer to Section 3.1). For information on how to load the disk refer to Section 4.9.

A. Diagnostic Disk #1 - Processor Checkout

```
.R  FKAA??   11/34 Basic Instructions Test
.R  FKAB??   TRAPS Test
.R  FDAC??   11/34 EIS Test
.R  FKTG??   Memory Management
.R  FKGH??   Memory Management
.R  ZQMC??   0 - 124K Memory Exerciser
```

OR

.R ENASA - Exercises all system components simultaneously.

```
Note:  Operator input is designated by underline.
DEC/X-11 EXERCISER (MONITOR V02.1) MD-ZZ-CXMON-B
MONITOR:  C
SYSTEM SIZE:  00064 K
WRITE BUFFER ROTATION ON
KT ON
PARITY ERROR TRAPPING ENABLED
TO TEST LD MEDIA CLR LOC 40
CMD>MAP
CMD>
```

```
LPAF0 AT VA:  070712 STAT:  140000 LINE PRINTER
TMBK0 AT VA:  072444 STAT:  150000 MAG TAPE
RKAG0 AT VA:  105042 STAT:  150000 RK05
KWBJ0 AT VA:  112312 STAT:  140000 CLOCK (KW11-P)
CPAG0 AT VA:  057266 STAT:  040020 PROCESSOR (BASIC INST.)
CPBJ0 AT VA:  061150 STAT:  040020 PROCESSOR (EIS)
FPBC0 AT VA:  063026 STAT:  040020 PROCESSOR (FLOATING POINT)
BMCN0 AT VA:  102366 STAT:  040020 BOOT MODULE
KEAD0 AT VA:  111144 STAT:  040020 KE11
CMD>DES BMCN0*
CMD>DES RKAG0*
CMD>RUN
BSY>
```

* The command DES is used to tell the program to disallow operation on that particular component.

B. Diagnostic Disk #2 - RK05 Verification and Formatting R - ZRKI??
Used to Verify or Format Disk. Procedure is as follows:
(1) Run program (.R ZRKI??)
(2) Remove diagnostic Disk #2 and insert disk to be formatted.
(3) Enter TYPE=3.
(4) Press the CLR button on the front panel of the 11/34.
(5) Press the #4 button - this will select Disk #2.
(6) Press LSR - this loads the Switch Register with the octal #4 selecting Disk #2.
(7) Press the CNTRL and CONT. switches simultaneously for program to continue.
(8) Program continues now formatting and verifying whether the Disk in #2 drive is good or bad.

C. Diagnostic Disk #3
C WHYME Data Compressor Diagnostics
R CHNTST Prints out A-D channel outputs in octal

D. RT11 Diagnostic Disk
R ENCHV Encoder Channel Verify, displays selected A-D channel outputs to 714 front panel.
NOTE: Channel numbers selected must be input in Octal format.
R Noise Tests Noise level of the system.
R MinMax Tests Noise level of the system.
R CalCHK Tests Noise level of the system.

3.3 Analog System Verification

3.3.1 Discriminator Verification

A. Install Plumbrook calibration patchboard.
B. Patch FM calibrator output (PP 31, 32) to AMP/DELAY inputs 1 through 4 (B,C,D,E 31,32).
C. Place the FM calibrator switch to AUTO.
D. Observe all discriminator front panel meters.
E. Proper operation is that all meters deflect from LBE through CF to UBE.
Note: Detranslated channels deflect UBE to LBE. LBE is a negative voltage but a positive input.

3.3.2 Sabre III Analog Recorder Verification

A. Place tape on analog recorder as defined in the Recorder Operations procedure. (Section 4.2)
B. Install the Plumbrook calibration patchboard.
C. Press the FWD and RECORD switches on the recorder. Both lights should be lit and tape should start forward motion and record data.
D. With an oscilloscope, monitor the reproduce electronics output tracks 1 through 14 to verify a signal is being recorded.
   Note: You should observe a multiplex signal approximately 3 V p-p. These tracks can also be monitored on the patchboard at TRK 1 through TRK 14 at coordinates A 33,34 through P 33,34.

3.3.3 Remote and Control Room Multiplexer Verification

A. Install Mod0.PB patchboard.
B. Monitor mux outputs with an oscilloscope (BB-LL 31,32). You should observe a 3-4V p-p multiplex signal.
C. Press the Lo Cal and Hi Cal switches on the Cal control panel and observe discriminators for appropriate deflections for RMU multiplexed signals. (Refer to Plumbrook Site Manual).
D. Patch the control room muxes (H,J,K,L 31,32) one at a time into AMP/DELAY input #2. Verify that data is observed per each discriminator. This is a means of verifying each VCO in an individual mux is functioning. (Refer to Plumbrook Site Manual for VCO location and voltages).

3.4 Digital System Verification

3.4.1 ADC and DCU data and channel verification

A. Install desired patchboard.
B. Initialize system RT11 - Diagnostic Disk (refer to Section 3.1).
C. Run program ENCHV (.R ENCHV).
D. Input channel number (octal) desired to verify.
E. Observe output of selected channel on 714 DCU front panel display.
   Note: Display will be in an Octal format 0 to 7777 — 0 representing -5 volts into the ADC and 7777 representing +5 volts into the ADC.
F. Repeat steps C and D as necessary for all channels desired to be checked and verified.
   Note: This program can be used to verify discriminator output, patchboard wiring and system wiring through the ADC and DCU.

4.0 System Operating Procedures

4.1 Preparatory Actions for Taking Data

4.1.1 Remove existing digital and analog tapes from recorders.

4.1.2 Clean tape heads and place new tapes on recorders.

4.1.3 Prepare tape units to record (refer to Recorder Operations, Sections 4.2 and 4.3).

4.1.4 Calibrate FM discriminators and brush recorders (refer to Site Manual and Calibration Procedure).

4.1.5 Verify correct patchboard is being used (refer to patchboard listing, Section 5.3).

4.1.6 Verify all RMU signal conditioner cards are functioning by pressing Lo Cal and Hi Cal switches on the calibration control panel and observe the appropriate discriminator channel.

4.1.7 Verify all necessary data channels on the patchboard have been patched to the brush recorder and/or A-D converter.

4.1.8 Check that the time input (realtime or playback) is patched to A 31,32 and verify that the time code is translating time correctly.

4.1.9 Place the Disk 0/1 front panel RUN/LOAD switch to the RUN position. Wait for READY and ON CYL light to come on.

4.1.10 On the PDP 11/34 front panel:
A. Press the CNTRL and HALT switches simultaneously.
B. Press the CNTRL and BOOT switches simultaneously.

4.1.11 Keyboard Operations - the operator's terminal responds as follows:
Note: Operator input is designated by underline.

```
004360 151726 001036 012040
$DK
DEVICE TT01:  NOT IN CONFIGURATION
  RSX-11M V3.1 BL22  64K  MAPPED
>RED DK0:=SY0:
>RED DK0:=LB0:
>MOU DK0:SYSTEM
>@(1,2)STARTUP
>* PLEASE ENTER TIME AND DATE (HR:MN DD-MMM-YY) (S): 04-MAY-81
>TIM 04-MAY-81
>ACS SY0:/BLKS=200
>*DO YOU WISH TO RUN TELEVENT/ (Y/N):Y
>MOU DK1:/OVR
>SET /UIC=(30,23)
>;
>; INSTL.CMD
>;
```

```
>; INSTALL TELEVENT
>;
>INS (1,1)DEVPAR
>LOA IX:/PAR=IXPAR
>LOA OC:/PAR=OCPAR
>SET /UIC=(30,23)
>INS DK1:ACODAB
>INS DK1:CDU
>INS DK1:D714
>INS DK1:DCMD
>INS DK1:DPDO
<INS DK1:DSKINT
>INS DK1:ERRPOL
>INS DK1:MTDUMP
>INS DK1:MWFM
>INS DK1;RIPTBL/PRI=100.
>INS DK1:TOP
>INS DK:TEL/TASK=TEL..A/PRI=49.
>SET /UIC=(30,1)
>@<EOF>
>RUN TOP
>TELEVENT-11
RDY FOR EXEC CMDS
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
RDY FOR EXEC CMDS
TEL>.IC *
TEL>@MOD0.PB1 **
TEL>20RPM TEETERED ***
ENTER COMMENTS, END=NONE
TEL>TEST NUMBER=81-05-02
ENTER COMMENTS, END=NONE
TEL>TAPE ID = PB10419L
ENTER COMMENTS, END=NONE
TEL>START TIME = 110:11:36
ENTER COMMENTS, END=NONE
TEL Z ****
NOTE *****
```

* After entering .IC and a carriage return, make sure that the Digital Recorder ON LINE light is lit.

** Enter program ID of program to be run (refer to Program ID Listing, Section 6.7).

*** Enter any comments with regard to the data or tape (refer to the Tape Header Format, Section 4.10).

**** This command is performed by depressing the CTRL key found on the lower left hand side of the keyboard and while holding the CTRL key down, depress the Z. This loads the comments onto the tape and the system is ready to take data.

***** After the CNTRL Z command. To get back into Televent to setup a new program. Type the underlined commands. This is a shorter method of preparing the system for data rather than rebooting the system.

```
TEL> Z
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL>0
RDY FOR EXEC CMDS
TEL>.EX
@ABO
>;
>;  ABO.CMD
>;
>ABO TOP
ABO — TASK NOT ACTIVE
>ABO TEL..A
TASK "TEL..A" TERMINATED
ABORTED VIA DIRECTIVE OR MCR
>ABO RIPTBL
TASK "RIPTBL" TERMINATED
ABORTED VIA DIRECTIVE OR MCR
AND WITH PENDING IO REQUESTS
>INS DK1:[30,23]ACODAB
>@ <EOF>
>RUN TOP
>TELEVENT-11
RDY FOR EXEC CMDS
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
RDY FOR EXEC CMDS
TEL>.IC
TEL>@MOD0A.CL4   OR whatever the program ID is.
TEL>TAPE ID = CL20314U
ENTER COMMENTS, END= NONE
TEL>START TIME = 073:20:45
ENTER COMMENTS, END= NONE
TEL>TRIGGER = 02S056
ENTER COMMENTS, END= NONE
TEL>VARIABLE PITCH
ENTER COMMENTS, END= NONE
TEL> Z
```

4.2 Sabre Analog Recorder Operation

4.2.1 Loading Analog Recorder

A. With the power indicating lamp off (power supply unit) or the POWER indicating pushbutton off (control panel), align all the guiding pins on the dual hub. This action will lock the two hubs so they will not turn independently.
B. By aligning the slots on a full reel of tape with the guiding pins on the hub, place the full reel onto the inner hub. The tape should feed off when the reel turns clockwise (in the FWD mode).
C. While holding the reel with one hand turn the inner hub 20° clockwise until the hub locks the reel into position.

D. To release the hubs from each other, turn the locking pin (the pin in the 1¼ inch slot) counterclockwise while holding the squared guiding pin which is located directly behind the locking pin.
E. Place an empty reel onto the outer hub and lock it in place by holding the reel and turning the hub 20° clockwise until secured.
F. Refer to the tape threading diagram and thread tape over guide #1 and below the lower tape tension arm.
G. Continue with the tape over the right side of the footage counter and the tape sense post, over the right translation post, and under the left translation post.
H. Thread the tape up (to the left of guide #2) between the capstan and the right pinch roller, over the record head and around the inertia dampening roller, then down past the reproduce heads, between the capstan and left pinch roller, and to the right of guide #3.
I. Continue with the tape below the upper tape tension arm, over guide #4, and onto the empty outer reel for several turns.
J. Inspect the entire tape path to ensure that the tape is threaded and aligned correctly.

4.2.2 Recording Data on the Sabre Recorder
A. Verify RMU and VCO outputs are patched to the recorder inputs (correct patchboard) and time is patched to Track 1.
B. Verify that the Time Code is in the translate mode, the master clock is patched to the translator input (A 31,32) and the clock is reading the proper time.
C. Press the FWD and RECORD buttons on the recorder.
D. Verify that the recorder (FWD and RECORD) lights are lit and the tape is in motion.
E. As a precaution, use an oscilloscope to verify that data and time are being recorded by monitoring the Reproduce Amplifier outputs.
F. Log time, tape ID, tape speed and any comments in the tape log.

4.2.3 Sabre Recorder Analog Data Playback
A. Calibrate discriminators and TSC units (refer to Calibration Procedures, Section 2.0).
B. Load desired analog tape per Analog Tape Procedure, Section 4.2.1.
C. Ensure proper patchboard is in system.
D. Patch desired recorder output tracks to FM AMP inputs.
E. Ensure time is patched to translator.
F. Search tape for desired start time.
G. Once start time has been found and everything is ready for playback (patching, digital tape, etc.), press FWD on the recorder for data playback.

4.3 Digital Recorder Operation

4.3.1 Turn on power to the digital tape recorder.

4.3.2 Clean record head, captans and tape path.

4.3.3 Use guide (diagram) on front of the tape machine to thread tape and put at least 3 windings of tape on the upper reel.

4.3.4 Press the LOAD button on recorder. Tape will load into postion. Verify the ON LINE light is lit.

4.3.5 Calibrate FM system (refer to Calibration Procedures, Section 2.0).

4.3.6 Load analog tape (refer to Analog Recorder Operation Procedure, Section 4.2).

4.3.7 Search the analog tape for start time (only if analog playback).

4.3.8 Ensure proper patchboard is in the system. If it is an analog playback, ensure the necessary recorder output tracks are patched to the proper AMP IN inputs (FM system) and the proper A-D channels are patched.
Note: If realtime data is to be recorded, be sure the proper RMU and VCO outputs are patched accordingly.

4.3.9 Intialize the system (refer to System Operating Procedures, Section 4.1)

4.3.10 System is now ready to take data
A. To start taking digital data, press the INTERRUPT CONTROL START button on the calibration control panel. Verify the interrupt starts the digital tape in motion.
Note: Ensure a once-per-rev or equivalent signal is patched to the force input.
B. To stop taking data, press the STOP button. Log start and stop times in the site tape log.

4.3.11 To save the digital tape and store it properly, an EOF (end of file) mark must be written on the tape. This is done after the completion of the data run by the following commands.
TEL RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL 0
This causes the tape to electronically write an EOF mark on the tape and to rewind the tape.

4.3.12 Log the tape ID and any pertinent information in the Tape Log.
Note: For more details on taking digital data refer to Recording Mod0 (Realtime) Data, Section 4.4 or Playback of Remote Site Data, Section 4.5.

4.4 Recording Mod0 (Realtime) Data

4.4.1 Prepare the Analog System for Recording
A. Install the correct patchboard for MOD0.PB. Ensure that the once per rev signal is patched at the Force Request Input (ZZ 33,34). Also, ensure the Reference Wind Speed (ask H. Pfanner) is patched to ADC 24 (ZZ 21,22).
B. Clean the heads and tape path on the Sabre III and then load the analog tape (refer to Sabre Analog Recorder Operation, Section 4.2). Ensure the analog tape has been labeled and logged into the Plumbrook Tape Log.

C. Calibrate the FM discriminators (refer to Mod0 Discriminator Calibration (Realtime), Section 2.2)
D. Calibrate the Brush Recorders (NASA's responsibility) (refer to Brush Recorder Calibration, Section 2.4)

4.4.2 Preparation of the Digital System for Recording Data

a. Clean the head and tape path on the digital recorder and load the digital tape (refer to Digital Recorder Operation, Section 4.3)
B. Press the RUN/LOAD switch on the top RK05 Disk (DK0/1) to RUN (Rack #2).
C. On the PDP 11/34 front panel:
   1. Press the CNTRL and HALT switches simultaneously.
   2. Press the CNTRL and BOOT switches simultaneously.
D. Keyboard operations - the operator terminal responds as follows -
   Note: Operator input is designated by underline.

```
004360 151726 001036 012040
$DK
DEVICE TT01:  NOT IN CONFIGURATION
  RSX-11M V3.1 BL22  64K  MAPPED
>RED DK0:=SY0:
>RED DK0:=LB0:
>MOU DK0:SYSTEM
>@(1,2)STARTUP
>* PLEASE ENTER TIME AND DATE (HH:MN DD-MMM-YY) (S): 04-MAY-81
>TIM 04-MAY-81
>ACS SY0:/BLKS=200
>* DO YOU WISH TO RUN TELEVENT? (Y/N):Y
>MOU DK1:/OVR
>SET/UIC=(30,23)
>;
>; INSTL.CMD
>;
>; INSTALL TELEVENT
>;
>INS (1,1) DEVPAR
>LOA IX:/PAR=IXPAR
>LOA OC:/PAR=OCPAR
>SET /UIC=(30,23)
>INS DK1:ACODAB
>INS DK1:CDU
>INS DK1:D714
>INS DK1:DCMD
>INS DK1:DPDO
>INS DK1:DKSINT
>INS DK1:ERRPOL
>INS DK1:MTDUMP
>INS DK1:MXFM
>INS DK1;RIPTBL/PRI=100.
>INS DK1:TOP
>INS DK:TEL/TASK=TEL..A/PRI=49.
>SET /UIC=(30,1)
>@<EOF>
>RUN TOP
>TELEVENT-11
```

```
RDY FOR EXEC CMDS
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
RDY FOR EXEC CMDS
TEL>.IC *
TEL>@MOD0.PB1 **
TEL>20RPM TEETERED ***
ENTER COMMENTS, END=NONE
TEL>TEST NUMBER =81-05-02
ENTER COMMENTS, END=NONE
TEL>TAPE ID = PB10419L
ENTER COMMENTS, END=NONE
TEL>START TIME = 110:11:36
ENTER COMMENTS, END=NONE
TEL>Z ****
```

* After entering .IC and a carriage return, ensure the Digital Recorder ON LINE light is lit.

** Enter program ID of program to be run (refer to Program ID Listing, Section 6.7)

*** Enter any comments with regard to the data or tape (refer to the Tape Header Format, Section 4.10)

**** This command is performed by depressing the CTRL key found on the lower left hand side of the keyboard. While holding the CTRL key down, depress the Z. This loads the comments onto the tape, and the system is ready to take data.

NOTE: After the CNTRL Z command to get back into Televent to setup a new program, type the underlined commands. This is a shorter method of preparing the system for data rather than rebooting the system.

```
TEL> Z
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL>0
RDY FOR EXEC CMDS
TEL>.EX
@ABO
>;
>;  ABO.CMD
>;
>ABO TOP
ABO — TASK NOT ACTIVE
>ABO TEL..A
TASK "TEL..A" TERMINATED
ABORTED VIA DIRECTIVE OR MCR
>ABO RIPTBL
TASK "RIPTBL" TERMINATED
ABORTED VIA DIRECTIVE OR MCR
AND WITH PENDING IO REQUESTS
>INS DK1:[30,23]ACODAB
>@ <EOF>
>RUN TOP
>TELEVENT-11
RDY FOR EXEC CMDS
```

```
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
RDY FOR EXEC CMDS
TEL>.IC
TEL>@MOD0A.CL4   OR whatever the program ID is.
TEL>TAPE ID = CL20314U
ENTER COMMENTS, END= NONE
TEL>START TIME = 073:20:45
ENTER COMMENTS, END= NONE
TEL>TRIGGER = 02S056
ENTER COMMENTS, END= NONE
TEL>VARIABLE PITCH
ENTER COMMENTS, END= NONE
TEL> Z
```

E. Now the digital tape is ready to begin taking data.
   (1) When you are ready, start the analog tape (FWD and RECORD), log the tape ID, and the start time.
   (2) Ensure the tape speed is 1-7/8 IPS and verify the tape is recording by monitoring the reproduce output with a scope.
   (3) Start the digital tape by pressing the INTERRUPT CONTROL START switch (located above the data compressor or on the WTG Control Panel).
   (4) Verify digital tape motion. (Motion of tape will depend on whether a Force Request is received by the data compressor; ex. Once Per Rev). Motion of the digital tape indicates data is being taken.
   Note: It is at this point the Blade Calibration Points will be recorded (refer to Digital Tape Blade Calibration, Section 2.10)
   (5) Log the digital tape ID and other pertinent information into the Plumbrook Tape Log.

4.4.3 Termination of Data Acquisition
A. Stop the analog tape (log stop time, etc.).
B. Press the INTERRUPT CONTROL STOP switch to stop the digital tape.
   Note: Be sure all tape information has been logged.
C. To write an EOF mark and rewind the digital tape, use the following procedure on the console.

```
TEL RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL 0
RDY FOR EXEC CMDS
```

D. Label the digital tape (refer to Digital Tape Labeling Procedure, Section 4.11).
E. Prepare the digital tape for delivery to NASA Lewis Research Center, Cleveland.

4.5 Playback of Remote Site Data

4.5.1 Prepare Analog System for Playback

A. Clean heads, capstans, and tape path on Sabre III. Then load desired analog tape (refer to Sabre Analog Recorder Operation, Section 4.2) Ensure tape speed is set for 15/16 IPS.

B. Install correct patchboard to patch panel for the particular remote site playback (refer to Patchboard Listing, Section 7.4). Ensure a chord bending sensor or a once-per-rev signal is patched to the force input (ZZ 33,34).

C. Calibrate discriminators (refer to Remote Site Discriminator Calibration Playback, Section 2.3)

D. Calibrate brush recorders (refer to Brush Recorder Calibration, Section 2.4) Be sure to identify and label brush channels.

E. Patch RMU data tracks to discriminator inputs. Patch time track to the Time Translator Input (A 31,32). For more detailed discussion of time and data recorded on tapes from remote sites, refer to Sabre VI Operational Information in the appropriate site manual.

F. Search the tape to find desired starting time.

4.5.2 Preparation of Digital System for Analog Tape Playback

A. Clean the head and tape path then load the digital tape (refer to Digital Recorder Operation, Section 4.3)

B. Press the RUN/LOAD switch on the top disk (DK0) to RUN.

C. On the PDP 11/34 front panel:

1. Press the CNTRL and HALT switches simultaneously.
2. Press the CNTRL and BOOT switches simultaneously.

Keyboard Operations - the operator's terminal responds as follows:
Note: Operator input is designated by underline.

```
004360 151726 001036 012040
SDK
DEVICE TT01:  NOT IN CONFIGURATION
  RSX-11M V3.1 BL22  64K  MAPPED
>RED DK0:=SY0:
>RED DK0:=LB0:
>MOU DK0:SYSTEM
>@(1,2)STARTUP
>* PLEASE ENTER TIME AND DATE (HR:MN DD-MMM-YY) (S): 04-MAY-81
>TIM 04-MAY-81
>ACS SY0:/BLKS=200
>* DO YOU WISH TO RUN TELEVENT? (Y/N):Y
>MOU DK1:/OVR
>SET /UIC=(30,23)
>;
>; INSTL.CMD
>;
>; INSTALL TELEVENT
>;
>INS (1,1)DEVPAR
>LOA IX:/PAR=IXPAR
>LOA OC:/PAR=OCPAR
>SET /UIC=(30,23)
>INS DK1:ACODAB
>INS DK1:CDU
```

```
>INS DK1:D714
>INS DK1:DCMD
>INS DK1:DPDO
>INS DK1:DSKINT
>INS DK1:ERRPOL
>INS DK1:MTDUMP
>INS DK1:MWFM
>INS DK1;RIPTBL/PRI=100.
>INS DK1:TOP
>INS DK:TEL/TASK=TEL..A/PRI=49.
>SET /UIC=(30,1)
>@<EOF>
>RUN TOP
>TELEVENT-11
RDY FOR EXEC CMDS
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
RDY FOR EXEC CMDS
TEL>.IC *
TEL>@MOD0.PB1 **
TEL>20RPM TEETERED ***
ENTER COMMENTS, END=NONE
TEL>TEST NUMBER =81-05-02
ENTER COMMENTS, END=NONE
TEL>TAPE ID = PB10419L
ENTER COMMENTS, END=NONE
TEL>START TIME = 110:11:36
ENTER COMMENTS, END=NONE
TEL>Z ****
```

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* After entering .IC and a carriage return, make sure that the Digital Recorder ON LINE light is lit.

** Enter program ID of program to be run (refer to Program ID Listing, Section 6.7).

*** Enter any comments with regard to the data or tape (refer to the Tape Header Format, Section 4.10).

**** This command is performed by depressing the CTRL key found on the lower left hand side of the keyboard. While holding the CTRL key down, depress the Z. This loads the comments onto the tape, and the system is ready to take data.

NOTE: After the CNTRL Z command to get back into Televent to setup a new program, type the underlined commands. This is a shorter method of preparing the system for data rather than rebooting the system.

```
TEL> Z
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL>0
RDY FOR EXEC CMDS
TEL>.EX
@ABO
>;
>;  ABO.CMD
>;
```

```
>ABO TOP
ABO — TASK NOT ACTIVE
>ABO TEL..A
TASK "TEL..A" TERMINATED
ABORTED VIA DIRECTIVE OR MCR
>ABO RIPTBL
TASK "RIPTBL" TERMINATED
ABORTED VIA DIRECTIVE OR MCR
AND WITH PENDING IO REQUESTS
>INS DK1: [30,23]ACODAB
>@ <EOF>
>RUN TOP
>TELEVENT-11
RDY FOR EXEC CMDS
TEL>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
RDY FOR EXEC CMDS
TEL>.IC
TEL>@MOD0A.CL4   OR whatever the program ID is.
TEL>TAPE ID = CL20314U
ENTER COMMENTS, END= NONE
TEL>START TIME = 073:20:45
ENTER COMMENTS, END= NONE
TEL>TRIGGER = 02S056
ENTER COMMENTS, END= NONE
TEL>VARIABLE PITCH
ENTER COMMENTS, END= NONE
TEL> Z
```

D. Now the digital tape is ready to begin taking data.
   (1) When you are ready, start the analog tape. Verify the Request light (REQ) on the front panel of the Data Compressor is cycling on and off.
   (2) Start the digital tape by pressing the INTERRUPT CONTROL START switch located above the Data Compressor.
   (3) Verify digital tape motion indicating data being taken (motion of tape will depend on whether a force request is received by the DCU; i.e. a once-per-rev signal).
   (4) Log the digital tape ID, etc., into the proper tape log.

4.5.3 Termination of Data Acquisition

A. When ready to stop taking data, press the INTERRUPT CONTROL STOP switch (this stops the digital tape).
B. To write an EOF mark and rewind the digital tape, use the following procedure on the console -

```
TEL RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL 0
RDY FOR EXEC CMDS
```

C. Label the digital tape (refer to Digital Tape Labeling Procedure, Section 4.11).
D. Prepare the digital tape for delivery to NASA Lewis Research Center, Cleveland.

4.6 Brush Recorder Operation

4.6.1 Patch channels desired into Brush Recorder inputs on the patchboard.

4.6.2 Press the power switch and turn units on.

4.6.3 Make sure recorder is in local mode.

4.6.4 Depress button for desired chart speed.

4.6.5 With a zero volt (CF) input adjust pen to position desired using the front panel position potentiometer.

4.6.6 With a voltage input (± 5V ± 20MV) adjust the pen to position using the sensitivity (gain) adjustment located next to the position Pot.
Note: Gain of the Pre Amp can be selected by the Sensitivity switch. For individual channel calibration refer to the appropriate site manual sensor information. For other information pertaining to operation of recorder (such as changing paper, replacing pen, pen motor, etc.) refer to Brush Operations manual.

4.7 Time Code Generator Setup

4.7.1 Set mode switch to Hold.

4.7.2 Set decade time switches. Starting with seconds, put the correct time in. After each unit of time has been selected press the set button to set the time in the counters. Do this for minutes, hours and days.

4.7.3 After the proper time has been loaded, return the mode switch to Generate. Then press the start button (next to the mode switch), and the clock should start counting.
Note: This unit is normally left in the translate mode and used as a slave clock translating time from the master clock in the WTG control room.

4.8 Searching Analog Tape for Time
Since there is no tape search unit, searching for time on the analog tape requires the following.

4.8.1 Patch recorded time track output to translator input.

4.8.2 Verify Time Code Generator is in the translate mode.

4.8.3 Run tape fast forward several hundred feet and stop.

4.8.4 Run tape forward - observe time on translator.

4.8.5 Run tape fast forward (or reverse, as is appropriate) until the desired time is found.

4.9 Operating RK05 - Disk Drive Unit

4.9.1 RK05J Disk Drive

A. To load disk -
   1. Turn power to "DC ON" on PDP 11/34.
   2. Open access door and insert disk.
   (3) Place RUN/LOAD switch to RUN position.
   (4) When front panel READY light comes on, system can be initialized (refer to System Diagnostic Initialization, Section 3.1)

B. To unload or remove disk -
   (1) Place RUN/LOAD switch to LOAD position.
   (2) When front panel LOAD light comes on, open disk drive access door and remove disk.
   (3) Remove or replace disk as desired.

4.9.2 RK05F Disk Drive

This disk drive unit is configured as a fixed head disk. The only controls for this disk are ON or OFF.

A. To turn disk ON -
   (1) Place RUN/LOAD switch to RUN position.
   (2) When front panel READY light comes on, system can be initialized (refer to Sections 4.1.9 through 4.1.11).

B. To turn disk OFF -
   (1) Place RUN/LOAD switch to LOAD position.

4.9.3 Initializing Disk

A. LOAD formatted Disk into disk drive 2.
   Note: Refer to 3.2.1 Formatting Disk.
B. Boot up system - Section 4.0
C. Enter >INI DK2: FILE.NAME*
   * Arbitrary Label

4.9.4 Transferring Files Disk to Disk

A. Boot system - Section 4.0
B. Load disk to obtain files from (or transfer to) into Disk drive 2.
C. Enter the following commands
   (1) >MOU DK2:/OVR This mounts DK2
   (2) >PIP DK2:[30,1]/UF=DK0:[30,1]*.*;*
   This command transfers all files in UIC (User ID Code) [30,1] from DK0 to DK2 UIC [30,1]
   Note: /UF creates UIC if it doesn't exist.
   OR
   >PIP DK0:[30,1]*.*;*=DK2:[30,1]*.*;*
   This command transfers all files in DK2[30,1] to DK0[30,1]
   (3) >PIP DK2:[30,1]=DK0:[30,1]FILE.NAME;NN
   This command transfers the file named from DK0 to DK2
   Note: Underline indicates command entered terminal.

4.9.5 Printing File(s) from Disk

A. Boot disk - Section 4.0
B. >PIP - Section 5.3 Invokes PIP
C. PIP>DK2:/DIR - Prints DK2 directory
D. PIP>DK0:/DIR - Prints DK0 directory
E. PIP>TI:=FILE.NAME - Prints File or PIP>FILE.NAME /LI

4.10 Digital Tape Header Format

The following is a basic format for the tape header which is entered onto the digital tape through the comment file.

```
TEL>@MOD0.PB1 *
TEL>20 RPM TEETERED **
ENTER COMMENTS, END=NONE
TEL>TEST NUMBER = 81-05-02
ENTER COMMENTS, END=NONE
TEL>TNU 87 = 14R002 REF WS
ENTER COMMENTS, END=NONE
TEL>TAPE ID = PB10609J
ENTER COMMENTS, END=NONE
TEL>START TIME = 160:09:48
ENTER COMMENTS, END=NONE
TEL>Z***
```

* Program being run

** Test Name

*** This command is performed by depressing the CTRL key found on the lower left hand side of the keyboard. While holding the CTRL key down, depress the Z. This loads the comments onto the tape and the system is ready to take data.

Note: List working and nonworking windspeed and wind direction before the tape ID. Also, list sensors or other pertinent information at this time.

4.11 DIGITAL TAPE LABELING PROCEDURE

TAPE ID

TWO LETTERS IDENTIFYING SITE

LAST DIGIT OF YEAR

TWO DIGITS INDICATING MONTH

TWO DIGITS INDICATING DAY

HOUR OF DAY TAPE BEGINS

370

LABEL PLACED ON BACK OF TAPE

LABEL TO BE PLACED ON FRONT OF ALL PLUMBROOK TAPES

NASA-LEWIS RESEARCH CENTER

PB 30416I

CORRIGAN/DEB 4-16-83

TWO LABELS ON OUTER RIM OF TAPE CASE

PB
3
0
4
I
6
I

2 PER TAPE

LABEL TO BE PLACED ON FRONT OF ALL TAPES OTHER THAN PLUMBROOK TAPES

NASA-LEWIS RESEARCH CENTER

MB 30319Q

NEUSTADTER/DEB 3-19-83

A. Mark two small labels with TAPE ID and place labels on outer rim of the tape case.
B. For Plumbrook tapes, mark one large label with TAPE ID and CORRIGAN/DEB and place on tape.
C. For other sites, mark one large label with TAPE ID and NEUSTADTER/DEB and place on tape.
D. Mark one small label with 370 (computer ID) and place it on back of tape.

KEY

SITE - CL = Clayton, New Mexico
BI = Block Island, Rhode Island
CU = Culebra, Puerto Rico
HA = Hawaii
BN = Boone
PB = Plumbrook
PS = Palm Springs, Calif.
MB = Medicine Bow, Wyoming
CB = Coos Bay, Or.
FS = Block Island Fuel Study
G3 = Goodnoe Hills WTS 3
G2 = Goodnoe Hills WTS 2
G1 = Goodnoe Hills WTS 1

HOUR - A = 0000 I = 0800 Q = 1600
B = 0100 J = 0900 R = 1700
C = 0200 K = 1000 S = 1800
D = 0300 L = 1100 T = 1900
E = 0400 M = 1200 U = 2000
F = 0500 N = 1300 V = 2100
G = 0600 O = 1400 W = 2200
H = 0700 P = 1500 X = 2300

4.12 Remote Site Analog Tape Logging Procedure

4.12.1 Upon arrival of tape mailer, open and inspect tapes. Note any damage or comments.

4.12.2 Label tapes with consecutive ID number found in the Analog and Digital Tape Log.

4.12.3 Log the following items in the particular remote Site Analog Tape Log (incoming) -
A. Tape ID
B. Reel number (if none, assign one)
C. Date received
D. Start and stop times
E. Quality of reel (damages)
F. Digital tape ID (when processed)

4.13 Remote Site Analog Tape Mailing Procedure

4.13.1 Pick two tapes, either new or degaussed, that are in good condition.

4.13.2 Make sure the reels have been assigned a reel number. If they have not, assign one.

4.13.3 Put the two tapes in the tape mailer.

4.13.4 Log the following -
A. Old tape ID
B. Reel number
C. Degaussed date
D. Date sent
E. Where being sent

4.13.5 Seal and label tape mailer.
Note: Each mailer has been assigned a particular site (see below).

4.13.6 Ship via UPS or US Priority mail to the proper site.
Note: Tape mailers numbers 1 and 2 are assigned to Clayton, 3 and 4 to Block Island, 5 and 6 to Culebra, 7 and 8 to Hawaii, 9 and 10 to Boone, and 11 and 12 to the minivan.

5.0 System Software Fundamentals

5.1 Booting Up System

5.1.1 Place the Disk 0/1 front panel RUN/LOAD switch to RUN.

5.1.2 On the PDP 11/34 front panel:
A. Press the CNTRL and HALT switches simultaneously.
B. Press the CNTRL and BOOT switches simultaneously.

5.1.3 Keyboard operations - the operator's terminal responds as follows -
Note: Operator input is designated by underline.

```
004360 151726 001036 012040
$DK
DEVICE TT01:  NOT IN CONFIGURATION
   RSX-11M V3.1 BL22  64K  MAPPED
>RED DK0:=SY0:
>RED DK0:=LB0:
>MCU DK0:SYSTEM
>@(1,2)STARTUP
>* PLEASE ENTER TIME AND DATE (HR:MN DD-MMM-YY)  (S): 04-MAY-81
>TIM 04-MAY-81
>ACS SY0:/BLKS=200
>* DO YOU WISH TO RUN TELEVENT? (Y/N):Y
>MCU DK1:/OVR
>SET /UIC=(30,23)
>;
>; INSTL.CMD
>;
>; INSTALL TELEVENT
>;
>INS (1,1)DEVPAR
>LOA IX:/PAR=IXPAR
>LOA OC:/PAR=OCPAR
>SET /UIC=(30,23)
>INS DK1:ACODAB
>INS DK1:CDU
>INS DK1:D714
>INS DK1:DCMD
>INS DK1:DPDO
>INS DK1:DSKINT
>INS DK1:ERRPOL
>INS DK1:MTDUMP
>INS DK1:MWFM
>INS DK1:RIPTBL/PRI=100.
>INS DK1:TOP
>INS DK1:TEL/TASK=TEL..A/PRI=49.
>SET /UIC=(30,1)
>@ EOF
```

5.1.4 At this point the operator has to decide whether to RUN a utility program (PIP, EDI, DMP) or the Televent Operator Communication Package (TOP).

5.2 Using the RSX-11M Terminal

5.2.1 RSX-11M Terminal Control Characters - some of the most commonly used characters are as follows:

CTRL/C Gains the attention of the Monitor Console Routine (MCR), which interprets commands to the operating system. In most cases the system responds to CTRL/C by displaying the explicit MCR prompt:

```
MCR>
```

This prompt indicates that the system is ready to accept input from your terminal.

CTRL/O Alternately suppresses and resumes the display of output at your terminal.
For example, if you are running a program that generates unwanted output, type CTRL/O. The system then temporarily stops displaying output until you type CTRL/O again to resume output display. If you do not type another CTRL/O, the system will discard the entire output and then return the default MCR prompt (>) to let you know output is finished.
. When you type CTRL/O after a previous CTRL/O, output display resumes further down in the file than the point at which you halted it with the first CTRL/O.

CTRL/S and CTRL/Q CTRL/S stops the display of output at your terminal until you have typed CTRL/Q to resume it. For example, if you are using a CRT terminal that displays output too quickly for you to read, type CTRL/S to halt the display. When you have read what is on the screen, type CTRL/Q to restart the output display. Repeat the process until you have read the entire file.
. When you type CTRL/Q after a CTRL/S, output display begins where it stopped. The total output can still be displayed on your terminal.

CTRL/R Performs a carriage return and reprints the current line on your terminal, omitting any deleted characters, and making the line easier to read. Before terminating the line with a carriage return, type CRTL/R to ensure that you have made the right corrections. For example:

```
MISTAKE/EAK/AKE R
MISTAKE
```

CRTL/U Deletes the current line. This allows you to retype an entire line when individual corrections would be impractical. Remember CRTL/U must be typed before the carriage return in order to delete that line. After the carriage return is entered, you must use an editing command from an editor to delete a line.

CRTL/X Clears your terminal's typehead buffer and enables you to type additional characters. The typehead buffer is an RSX-11M feature which allows your terminal to save up to 36 characters before it processes their commands. A "bell character" echoes on your terminal no matter what character you type when this buffer is full. CRTL/X clears the buffer and enables you to resume typing.

CRTL/Z Exits from many RSX-11M system (and user) tasks and returns control of the system to MCR.

5.2.2 MCR Commands - the commands that interpret terminal input to control system operations are called Monitor Console Routine (MCR) commands. You communicate with MCR by entering a command line:

commandname parameter(s)/keyword(s) line terminator

(Commandname consists of three or more letters, terminated by a space, uniquely identifying an MCR function. MCR only reads the first three letters. Additional letters merely help you identify the command.)

Both the explicit MCR prompt and the default prompt (>) indicate MCR is ready to accept input from your terminal. If you enter CTRL/C when you are using a system program other than MCR, you can issue one MCR command. The system executes that command and returns you to the task you were in when you entered CTRL/C. Both DIGITAL-supplied and user-written tasks can request input by displaying a task prompt at a terminal.

5.2.3 Error Messages
When MCR receives input it does not recognize or it knows to be incorrect, it displays a message on your terminal.

The appropriate user response to an error condition depends on the message displayed. All messages returned by MCR commands are explained in the RSX-11M/M-PLUS MCR Operations Manual. Command descriptions in that manual include a list of possible messages that the command can generate. The manual also includes an alphabetical list of all MCR messages.

Each message a task prints on your terminal begins with a 3-letter name of the associated command or task sending you the message. When you encounter an error while running a system task, such as a text editor, look for an explanation of the message in the documentation for that task.

5.3 Using Utility Programs (File Manipulation)

5.3.1 Peripheral Interchange Program (PIP) - used to transfer files from one device to another.

A. RSX File Specification Format - the format of a full file specification is:

dev:(g,m)filename.filetype;fileversion

dev:	The name of the device that holds the volume on which the input file resides (or on which the output file will reside).
(g,m):	A User Identification Code (UIC) identifying the User File Directory (UFD) that contains (or will contain) the file.
filename:	The 0-9 character name you supply for the file.
filetype:	The 0-3 character type you supply for the file.
fileversion:	An octal number that distinguishes between different versions of the same file.

Examples of full file specification are:

MM0:(116,23)CHARLA.FOO;32
DK1:(203,204)FOO.FUM;5
DK2:(34,63)WHO.FOO;3

B. The Device Name - the device name specifies the volume on which the file resides. The name consists of two alphabetic characters and an optional 1 or 2-digit octal unit number followed by a colon (:). When the name does not include a unit number, the system tries to use unit number 0. Device names in the above examples and their corresponding abbreviations are listed below:

Name	Physical Unit
DK1:	RK05 disk, unit 1
DK2:	RK05 disk, unit 2
MM0:	Dec Mag Tape, unit 0

The device name can refer to one of two kinds of devices:

1) An actual physical device, such as the three listed above;
   or
2) A pseudo device which can represent a variety of physical units, depending upon which terminal enters the unit name.

For example, the name TI: is a pseudo device that refers to the terminal from which input is being entered. When you enter input from terminal 23 on your system, your physical terminal number is TT23: and your pseudo terminal is TI:. When you enter input from terminal 6, your physical terminal number is still TT6.

Another pseudo device name is SY:, which corresponds to your default system disk. All the files created so far in this manual reside on SY:

C. User File Directories - the User Identification Code (UIC) and User File Directory (UFD) are often used interchangeably in RSX-11M.

When you need to use files stored in other directories, you can use an MCR SET command to change your default UFD (SET /UIC=(g,m)) or you can specify a UFC in the file specification. The MCR SET command changes the default UFD. However, neither of these actions changes the UIC under which you logged on.

For example, if you want a copy at your terminal of a file from another UFD, issue the command:

```
>PIP TI:=(30,23) SETUP.FSY<CR>
```

This command assumes that SETUP.FSY resides on your default system disk, in UFD(30,23).

D. Invoking PIP - you can invoke PIP from MCR in either of two ways:

1) The single line format, which executes one PIP command and returns control to MCR:

```
>PIP /LI<CR>
```

   or

2) The format that passes control to PIP and allows you to execute multiple PIP commands:

```
>PIP<CR>
PIP  /LI<CR>
```

Any command shown can also be executed in the method described in Number 2.

E. Displaying a Source File on Your Terminal - to display a copy of SETUP.BSY on your terminal, enter a PIP command in the following format:

```
>PIP TI:=SETUP.BSY<CR>
```

This command produces the following display:

```
;      SETUP.BSY   SETS UP THE 720 BSY
SETUP BIT SYNCHRONIZER
      RUN SCL
      BIT RATE = 1.60E5
      POLARITY = NORMAL
      INPUT SOURCE = 4          ;SIMULATOR INPUT SOURCE
      DETECTOR = FILTER SAMPLE
      LOOP WIDTH = MEDIUM
      INPUT CODE = NRZL
      END
;THIS IS THE END OF SETUP.BSY
```

F. /LI - Displaying User File Directories

Displaying Your UFD - All of the files you create are listed in your UFD. The PIP/LI command displays the UFD as follows:

```
>PIP /LI<CR>
```

Displaying Any UFD -

```
>PIP (g,m) /LI
```

Displaying Information of Specific Files - PIP allows you to obtain information about one file or a specific group of files in a directory. For example, if you want to see how many versions of ADD.TSK exist in your directory, issue the command:

```
>PIP SETUP.BSY;* /LI<CR>
```

G. /DE - Deleting Files

Once you know which files are listed in your UFD, you can decide which files you want to delete.

To delete file(s) with the PIP switch, issue the following type of commands:

1) For one file:

```
>PIP SETUP.SSI;1/DE<CR>
```

2) For more than one file:

```
>PIP SETUP.SSI;1, SETUP.SSI;. /DE<CR>
```

H. /PU - Purging Files

When you want to eliminate all but the highest version of files, the PIP Purge switch is often more efficient than the Delete switch. The following Purge command has the same effect as the above Delete command:

```
>PIP SET.* /PU<CR>
>
```

Purging does not affect any files in your UFD which only have one version. Note the file specification for the Purge switch does not include a version field.

I. Copying Files

Copying files is PIP's default function; that is, if you enter a legal PIP command line with no switches, PIP performs a copy operation. For example, the following command copies the file SETUP.BSY from your UFD on SY: to another UFD on SY:.

```
>PIP (30,34) SETUP.BSY = SETUP.BSY = SETUP.BSY<CR>
```

The command includes the call to PIP, followed by a file specification in the form:

outfile=infile

infile

The file to be copied

outfile

The new copy of the file.

When you omit the UFD, file name, file type, and/or version number in outfile, PIP defaults the UFD to your default UFD and the name, type, and version number of the file to the equivalent fields in the input file.

Before you can copy a file to a directory on another volume, the directory must exist on that volume. In a multiuser protection system your directory on SY: is the only UFD automatically created for you; in a non-multiuser system, no UFDs are automatically created. If the output volume specified in the above example does not contain a UFD corresponding to your UIC, PIP returns the message:

PIP — CANNOT FIND DIRECTORY FILE
xxn:(s,m)

J. IRE - Renaming Files

The PIP Rename (RE) switch allows you to rename existing files. For example:

>PIP BSY.SET;* = SETUP.BSY;*/RE<CR>

This command tells PIP to change the names of all versions of the files named SETUP.RSY to BSY.SET. Note you must explicitly specify either a number or a wildcard in both input and output version fields.

Note: For more details about PIP refer to the RSX-11 Utility Procedures Manual.

5.3.2 Creating Indirect Setup Command File & Using EDI

A. RSX Indirect Setup Command Files

An indirect setup command file is a text file containing a series of TELEVENT executive and input/output control commands exclusive to, and interpretable by, TELEVENT.

Rather than typing commonly used sequences of commands every time you want to setup, you can type the sequence once and store it in a file. The indirect setup command file is specified in place of the command lines normally submitted. For example:

RSX-11M
TEL>@SETUP:DCO

B. EDI(T)

The RSX-11M Line Text Editor (EDI) is a system program you can use to create a source file. (You can also use EDI to create other types of files, such as text files and data files).

C. Preparing to Invoke EDI

If you are under TELEVENT, you must terminate TELEVENT in order to invoke EDI. You can temporarily suspend TELEVENT by issuing the TELEVENT control command (.ID). When you do, you are under the RSX Operating System. To resume TELEVENT, enter RES REL..A. You can also terminate TELEVENT by issuing the TELEVENT executive directive (.EX). This terminates TELEVENT and also puts you under the RSX Operating System. To return to TELEVENT in this case, you must reinstall TELEVENT.

D. Using EDI

To invoke EDI, issue a call to the editor in the same way you issue an MCR command. (Remember you can always type CTRL/C to get the explicit monitor prompt and make sure your command is going to MCR).

```
>RUN $EDI
```

EDI displays its task prompt:

```
EDI>
```

To create a new file using EDI, specify a file name and a file type in the following form:

```
EDI>filename.filetype
```

filename

A 1- to 9-character alphanumeric string.

filetype

A 3-letter abbreviation, preceded by a period(.). The abbreviation is usually related to the file's contents. The following is the default extension for indirect command files:

.CMD

The following example illustrates the creation of an indirect command source setup file called SETUP.CMP.

```
EDI<CR>
>EDI SETUP.CMP<CR>
(CREATING NEW FILE)
INPUT
```

When EDI receives the name of a new file, it creates an empty file with that name and type displayed in the two lines shown in the example above. EDI prints INPUT to let you know it is ready to accept input from your terminal. Anything you type (except for control characters) becomes becomes part of the file called SETUP.CMP. You can then type in the source program for SETUP.CMP. When you terminate each line of input with a carriage return <CR>, EDI stores the line in a buffer. When you end the editing session, EDI writes the entire buffer to the file SETUP.CMP.

You can use the keyboard facilities described in Section 5.2.1 to correct any mistakes on the current line before you type <CR>. Once a line has been terminated and written to the buffer, you must use EDI commands to make any changes.

You can also enter the new file name and file type on the same line as the call to EDI. This quicker way to create a file is illustrated below. Note the use of the DELETE or RUBOUT key, CTRL/R, and CTRL/U in the example:

```
>EDI SETUP.CMP<CR>
(CREATING NEW FILE)
INPUT
SET CMP<CR>
FLE = 48<CR>
BLE = 52<CR>
BID = CMP1<CR>
BPR = 2<CR>
EST = INH<CR>
END<CR>
<TAB>;THIS IS THE END OF CMP SETUP <CR>
<CR>
*EX<CR>
(EXIT)
>
```


After you terminate the last line of text in the program, type a carriage return as the first character in the new line. EDI responds by displaying as asterisk(*) prompt. Until now, EDI was in Input Mode, the mode it entered to create a new file. Typing a carriage return <CR> at the beginning of a new line switches EDI to Edit Mode. The asterisk is EDI's prompt for commands.

The command EX(IT) instructs EDI to write SETUP.CMP to your disk area and to return control of your terminal to MCR.

E. Changing an Existing File

To edit an existing file with EDI, enter the same command you used to create a new file:

```
>EDI SETUP.CMP<CR>
```

Because a copy of SETUP.CMP now exists on disk, EDI responds differently, as follows:

```
>EDI SETUP.CMP<CR>
(00010 LINES READ IN)
(PAGE 1)
*
```

EDI creates a copy SETUP.CMP and enters Edit Mode, indicated by the asterisk (*) prompt. The message (00010 LINES READ IN) tells you the number of lines EDI has placed in its buffer. The lines in the buffer make up the text currently available for editing. The buffer may or may not contain the entire input file, depending on the size of the file and the buffer. To access text beyond the current buffer, issue a RENEW command in Exit Mode. Renew writes the current buffer to the output file and refills the buffer with the next block of text.

An internal line pointer determines the line within the buffer to be edited. When EDI reads in a buffer, the line pointer points to the line immediately preceding the first line of text. This allows you to insert one or more lines at the top. You can subsequently reposition the pointer by searching for a particular piece of text or by using commands that reposition the pointer.

F. Locating and Changing Text

The EDI commands listed below allow you to find and change text in a file. You can abbreviate most EDI commands to one or two letters. In the following text, the optional portion of each command is in parentheses ().

Command	Function
L(OCATE)	Locates a string of text in the current buffer.
C(HANGE)	Replaces one text string with another.
N(EXT)	Advances the line pointer to the next line (EDI displays the Edit Mode prompt (*) but does not display the line).
P(RINT)	Displays the current line on your terminal.
T(OP)	Positions the line pointer at the top of the current buffer.
BO(TTOM)	Positions the line pointer at the bottom of the current buffer.
‹CR›	Points to and displays on your terminal the next line in a file.

An example of an EDI editing session is shown below with text explaining what each command does to change or to locate lines in the file and print them on the terminal.

```
>EDI SETUP.CMP‹CR›
(00010 LINES READ IN)
(PAGE 1)
*LOCATE BLE‹CR›
*BLE = 50
```

The LOCATE command in the example above point to and prints the next line in the file (after the current line) containing the word BLE.

```
*CHANGE/50/52/‹CR›
*BLE = 52
```

The CHANGE command above changes the value 50 to 52. Note that the slash characters (/) are used to delimit both the old and new text strings. Any ASCH characters that are not used in either string can be used to delimit a string. EDI then prints the corrected line on your terminal.

```
*NEXT‹CR›
*
```

The NEXT command points to the next line in the text, but does not print it on your terminal.

```
*PRINT‹CR›
     BID = CMP1
*
```

The PRINT command above displays the current line on your terminal.

```
*LOCATE BPR<CR>
*
```

The LOCATE command points to and prints the next line in the file containing the word BPR.

```
*CHANGE/2/1/<CR>
*    BPR = 1
```

The CHANGE command above changes the number 2 to 1.

```
*LOCATE FLE = 48
(*EOB*)
```

The LOCATE command searches for a line containing FLE = 48. In this case, EDI reaches the end of the buffer (EOB) without finding the string FLE = 48. The EDI line pointer only moves forward through the buffer in response to a LOCATE command. It does not search backward through a file.

```
*TOP<CR>
*
```

The TOP command moves the line pointer to the top of the buffer (one line before the first line of text). At that point Edit Mode displays the asterisk (*) prompt.

```
*<CR>
SET CMP
*
```

When you enter a carriage return in response to the asterisk prompt, EDI prints the next line on your terminal. The carriage return also moves the EDI line pointer to the next line. Therefore, it performs the same function as the NEXT and PRINT commands. In this example the pointer points to the first line in the buffer.

```
*EXIT<CR>
(EXIT)
<
```

The EXIT command writes the current buffer and the remainder of the input file to the output file, closes both input and output files, and exits from EDI to MCR.

g. Inserting and Deleting Text

The EDI commands listed below allow you to insert and delete text in the file.

COMMAND	FUNCTION
I(NSERT)	Inserts one or more new lines of text in a file.
A(DD)	Adds text to an existing line.
D(ELETE)	Deletes the current line.
<ESC>	Points to and prints the previous line. Note, however, that <ESC> does not display the line you just entered with an Insert command. It moves the pointer up one line in the text and displays that line.
R(ETYPE)	Replaces the current line of text with a new line.

L(IST)	Prints on your terminal the lines remaining in the buffer, from the current line to the end. After the LIST command executes, the line pointer is reset to the top of the buffer.
TYPE n	Prints on your terminal the next n lines, but does not reset the line pointer.

An example of an EDI editing session is shown below with text explaining what each command does to insert or delete text.

```
>EDI SETUP.CMP<CR>
(00010 LINES READ IN)
(PAGE 1)
*
```

EDI retrieves the latest version of SETUP.CMP. Note that if you want to edit an earlier version of SETUP.CMP, you can include a version number in the command.

```
*INSERT<CR>
;    THIS PROGRAM IS THE SETUP FOR THE COMPRESSOR STREAM
<CR>
*<ESC>
(*BOB*)
<CR>
;    THIS PROGRAM IS THE SETUP FOR THE COMPRESSOR STREAM
*
```

The EDI INSERT command in the text above switches to EDI Input Mode and inserts text immediately before the first line of text already in the buffer. The second carriage return takes you back to Edit Mode. The <ESC> command from Edit Mode causes EDI to display the line before the current line. In this case, the line before the current line is the beginning of the buffer (*BOB*). The carriage return moves the pointer to the line you just inserted, which is now the first line of the text.

```
*LOCATE BPR<CR>
          BPR = 1
*ADD<TAB>      ;BUFFER ID
*PRINT<CR>
         BPR = 1            ;BUFFER ID
*
```

The LOCATE command finds the line on which a string occurs, the ADD (append) command attaches a comment text to the line, and the PRINT command displays the revised line.

```
*LOCATE END<CR>
;         END
*DELETE<CR>
*
```

The DELETE command deletes the current line and moves the pointer to the next line.

```
*<ESC>
;THIS IS THE END OF CMP SETUP
*
```

The ⟨ESC⟩ command causes EDI to point to and print the previous line in the buffer on your terminal.

```
*INSERT⟨CR⟩
⟨TAB⟩    END⟨CR⟩
⟨CR⟩
*
```

EDI enters insert mode and inserts a new line of text. The second carriage return causes EDI to reenter Edit Mode at the current line.

```
*TOP⟨CR⟩
*⟨CR⟩
;       THIS PROGRAM IS THE SETUP FOR THE COMPRESSOR STREAM
*RETYPE ;  SETUP.CMP - SETS UP THE CMP STRM
```

The TOP command repositions the line pointer to the top of the buffer. The carriage return points to and prints the next line, which in this case is the first line in the buffer. The RETYPE command replaces the current line with the text that follows the command.

```
*LIST⟨CR⟩
;         SETUP.CMP - SETS UP THE CMP STRM
SET CMP
FLE = 48
BLE = 50
BID = CMP 1
BPR = 1
EST = INH
END
;THIS IS THE END OF CMP SETUP
*
```

The LIST command displays the lines from the current line to the end of the buffer.

```
*EX⟨CR⟩
(EXIT)
```

When you issue the EXIT command, EDI writes the file to your disk area and returns control to MCR.

H. Some Basic EDI Commands

EDI allows the use of abbreviations in commands:
Parentheses () enclose optional command text.
The asterisk (*) can be used in place of any number in an EDI command.
An ellipsis (...) can be used in many search strings to identify characters between first and last characters of the string.

Command		Description
ADD string	A string	Adds the character string indicated to the end of the current line.
ADD AND PRINT	AP string	Also prints the entire line.
BEGIN	B(EGIN)	Sets the current line to the first line preceding the top line in the block buffer.
BOTTOM	BO(TTOM)	Moves the line pointer to the bottom of the current block.

CHANGE	(n)C(HANGE)/string1/string2(/)	Replaces string 1 with string 2 in the current line n times.
DELETE	D(ELETE) (n) or D(ELETE) (-n)	Deletes the current line(s) as specified above and n-1 lines if n is a positive number. Deletes n lines preceding the current line if n is a negate number.
DELETE AND PRINT	DP(n) or DP(-n)	Deletes the current line and prints the new current line.
EXIT	EXIT(filespec)	Transfers the remaining lines in the block buffer to the output file. Closes files, renames the output file if specified, and terminates the editing session.
FIND	(n)F(IND)string	Searches current block, beginning at the line following current line, for the nth occurence of the string. Sets the line pointer to the line it finds. A string must begin in the first column of the line to be a match.
INSERT	IN(SERT) (string)	Enters the specified string immediately following the current line. If no string is specified, EDI enters Input Mode.
KILL	KILL	Closes the input and output files and deletes the output file.
LIST ON TERMINAL	LI(ST)	Prints on the terminal all of the lines remaining in the block buffer.
LOCATE	(n)L(OCATE)string	Locates the nth occurence of the specified string. In Block Mode, the search stops at the end of the current block.
NEXT	N(EXT)	Advances the line pointer to the next line.
NEXT AND PRINT	NP(n) or NP(-n)	Establishes and prints a new current line.
PAGE LOCATE	(n)PL(OCATE) string	Searches successive blocks for the nth occurence of the string.
PASTE	PA(STE)/string1/string2(/)	Searches all remaining lines in the block buffer that contain string1 and replaces them with string2.
PRINT	P(RINT)	Prints the current line on your terminal.
RENEW	REN(EW)(n)	Writes the current blocks to an output file and reads a new block from an input file.

RETYPE	R(ETYPE)string	Replaces the current line with the specified string or deletes the current line if no string is specified.
SEARCH AND CHANGE	SC/string1/string2(/)	Locates string1 and replaces it with string2.
TOP	T(OP)	Moves the line pointer to the line preceding the top line of the current block.
TOP OF FILE	TOF	Returns to the top of the input file and saves all of the previously edited pages.
TYPE	TY(PE) (n)	Prints the next n lines on the terminal. The line pointer remains at the current line unless EDI reached the end of the block.
⟨CR⟩	⟨CR⟩	When in Input Mode, ⟨CR⟩ returns to Edit Mode. When in Edit Mode, ⟨CR⟩ prints the next line on your terminal and moves the line pointer to that line.
⟨ESC⟩	⟨ESC⟩	Points to and prints the previous line.

5.4 Operational Software

5.4.1 Televent 11 - Standard Software Package

A. Standard Software

Televent is a software package used to set up and control tasks for the acquisition and processing of real-time telemetry data. It operates in conjunction with the DEC RSX-11M Operating System. Televent is modularly designed to fully utilize the RSX-11M mult-tasking, multi-programming, and memory management capabilities. This modularity has been achieved by implementing six basic types of Televent tasks. Figure 1 briefly defines these tasks. A more detailed description of the various tasks is presented in the RSX-11M Televent Programmer's Guide.

The various Televent modules provide the user with the capabilities to set up the telemetry equipment, acquire data, control events (interrupt) and process the acquired data in real time. These capabilities are controlled by the operator via a simple Telemetry Language. All commands are entered in "English Language" ASCII character strings. No previous knowledge of computer languages or computer operating systems is required by the operator. Televent uses the RSX-11M indirect command file processor so that operator commands may be stored on a disk or any other device supported by the RSX-11M Operating System. These command files may be easily invoked by the operator, thus eliminating the need for the operator to re-enter often-used command sequences. Figure 2 lists the eight basic Televent directives. More detailed descriptions are found in the RSX-11M Televent Programmer's Guide.

Figure 3 is a typical test sequence using Televent. The functions starting with the system setup until the generating start interrupt are straight-forward, non-real-time processes. Beginning with the start interrupt, the real-time processing of data begins. This processing may include storage of data to bulk storage devices, display updating, limit checking, etc., as quoted to support specific user requirements. The processing is all synchronized to a number of system interrupts. The interrupts used on the NASA-LRC system are:

INTERRUPT	SOURCE	EVENT
Start Interrupt	EMR 2765	Tape search unit finds Start time, simulated by operator, or external hardware signal.
Input Buffer	EMR 2763	A DMA data transfer has filled a memory buffer.
Halt	EMR 2765	Tape search unit finds Stop time, simulated by operator, or external hardware signal.

Televent provides all interrupt control service for the EMR 760, 2763 and 2765 generated interrupts. When an interrupt is received, the appropriate routines (as specified by the operator) will be executed. The operator retains full control over the processing. The operator may, at any time, individually enable or disable any 760, 2763 or 2765 interrupts. In addition, Televent provides the operator the capability to synthesize 2765 interrupts.

Televent fully supports data acquisition with both the EMR 760 Universal Data Channel and the EMR 2763 Buffered Data Channel. Both the 760 and 2763 transfer 16-bit parallel data in a DMA (cycle stealing) mode. Automatic data chaining is a hardware feature of both devices. The size of the buffers transferred is operator selectable. When one buffer is filled, a Block End interrupt is triggered and buffer locations are automatically swapped.

Real-time processing continues until a Halt interrupt is generated. At this time, the operator may repeat the task or set up for a new task.

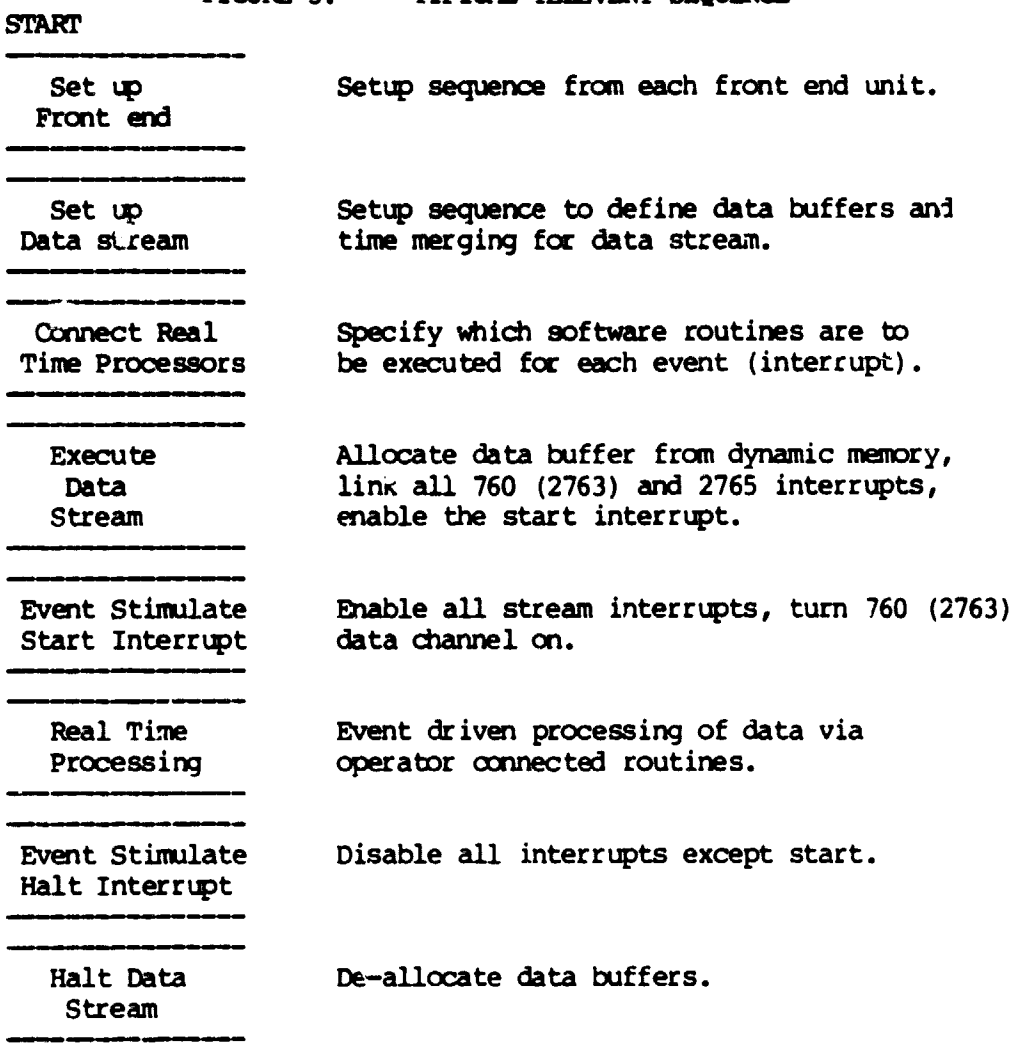
FIGURE 1. TELEVENT TASKS

TOP	Operator's I/O package. Provides simplified I/O to the operator for all Televent tasks.
TEL	Televent language interpreter which dispatches all executive commands (see Figure 2) to the appropriate tasks.
RIP	Real-Time Interrupt Processor tasks. Process all telemetry interrupts.
RUN	Non-real-time utility tasks.
SETUP	Task used to set up front end equipment or system tables.
CODAB	Consists of a number of tables and data blocks which define the hardware and software configuration of a system.

FIGURE 2. TELEVENT EXECUTIVE DIRECTIVES

Executive Directive	Function
SETUP	Used to specify "setup" information for a hardware unit or a software program.
END	Terminates a "setup" sequence.
CONNECT	Causes a software subroutine to be executed with the occurrence of a hardware stimulus (interrupt).
SCONNECT	Similar to the CONNECT, but used to indicate routines to be executed at a software priority at the occurrence of each event.
DISCONNECT	Used to sever the interface between a hardware stimulus and a software response.
EXECUTE	Used to initialize the system for data acquisition.
HALT	Used to terminate data acquisition.
EVENT	Provides user control of system events (interrupts). Enable, disable, stimulate, link.
RUN	Permits execution of "background" (i.e., non-real time) tasks.

FIGURE 3. TYPICAL TELEVENT SEQUENCE



B. TOP

TOP provides the operator I/O interface between Televent and the RSX-11M Operating System. User programs operating under Televent may also take advantage of TOP and, consequently, the RSX indirect command file capabilities.

TOP does not communicate directly with any device. All I/O with PDP-11 peripherals is accomplished through calls to the RSX executive. Similarly, all operator communication from Televent routines with PDP-11 peripherals is accomplished through calls to TOP.

This method of communication with computer peripherals allows future implementation of a different operating system with virtually no effect on the Televent main body.

There are basically two categories of operator directives to Televent:

1) TOP Directives
2) TEL Executive Directives

All operator directives to TOP are three characters long and begin with a dot. TOP directives are used to specify methods of operator communication with Televent. Some of the TOP directives are described in Figure 4. TOP directives control input devices and listing options available to the Televent user. Three of these options provide considerable flexibility to the Televent user. The first, the .IC command, allows the user to utilize the RSX indirect command line processor. Four levels of files may be accessed. Using the indirect command files allows the complete set of operator commands to be generated and tested well in advance of an actual test. At test time, the operator only enters several commands to invoke the pre-stored indirect command files. Not only is the possibility of operator errors almost eliminated, but these files are available for the next task, thus allowing an exact repeat capability. Using disk or magnetic tape for the command files medium provides fast execution of the system setup. As an example, entering the command @CR: from the terminal causes TOP to read input from cards. If a card contains a @DK:PCM.SIM, it would cause TOP to take input from a system disk file PCM.SIM. The file PCM.SIM might then contain the following:

```
;   PCM SIMULATOR DATA TEST
@SIGSIM.SET          ; Input from file SIGSIM.SET to
                       set up Signal Simulator
@BITSYN.SET          ; Input from file BITSYN.SET to
                       set up Bit Synchronizer
@FRMSYN.SET          ; Input from file FRMSYN.SET to set
                       up Frame Synchronizer
@SUBFRM.SET          ; Input from file SUBFRM.SET to set
                       up Subframe Synchronizer
```

```
@WORDSL.SET          ; Input from WORDSL.SET to set up
                       Word Selector
@PCM.SET             ; Input from PCM.SET to set up PCM
                       data link
<EOF>
```

Upon encountering the end of file for PCM.SIM, TOP resumes inputting from the card reader until it encounters an EOF card at which point it resumes inputting from the terminal device.

Another significant option is the command logger. This is enabled by entering .EC. This option will store on a disk file operator commands entered from the terminal or via the indirect command file processor. The time-of-day associated with each command is also saved. After task completion, this file may be printed or saved on another medium to provide a permanent task log.

The third option is the Televent idle command (.ID). This command allows TOP and TEL to be temporarily suspended, thus allowing the operator to use the terminal for RSX functions. It is important to realize that this command has no effect on the real-time interrupt processing modules (RIP's). Hence, after a task is started, the operator may initiate RSX programs to operate in a background mode while still processing real-time interrupts. A standard RSX RESUME TOP command will restart Televent.

FIGURE 4. TOP COMMANDS

TOP DIRECTIVE	DESCRIPTION
.KB	Keyboard enabled as the system input device. Present under all options.
.CR	Card reader enabled as the system input device. Requires the card reader option.
.PR	Paper tape reader enabled as the system input device. Requires the high-speed paper tape option.
.LI	List all information entered via the system input device, KBIN or KBINI. This information will be output via OUTL and will go the KB or LP, depending on their respective commands. This command is available on all options.
.NL	No list disables list (.LI) above, and is also available under all options.
.EL	Enable line printer allows output via OUTL to go to the line printer which is initiated at this time. The LP option is required for this command.
.DL	Disable line printer causes all outputs via OUTL to appear on the keyboard (this is default). LP option is required to use this command.
.IC	Enable indirect command file processor for input. FCS option is required for this command.
.RI	Resume indirect command file processing. Used after error condition has terminated indirect command file processing. FCS option required for this command.
.NI	Disable indirect command file processing. FCS option is required for this command.
.EC	Enable command log. FCS and LOG options are required for this command.
.DC	Disable command log. FCS and LOG options are required for this command.
.ID	Idle causes TOP to suspend itself until resumed by an MCR RESUME TOP command.
.EX	Exit causes TOP to perform the EXIT RSX system directive.
@ABO	Command allows return to Televent.

C. TEL

TEL is the Telemetry Language Executive task. Its purpose is to interpret operator input and dispatch the processing for each command to the correct televent task. TEL contains internal subroutines to process each executive directive. In some instances, TEL may process a portion of a directive and one or more Televent tasks will be called to complete the processing of the directive. When another task is initiated to process a directive, TEL suspends itself until resumed by the initiated task.

In all cases, any errors found in directive processing are reported to the operator. A readily understood message in English plus a task specific error code (in octal) are output on the operator's console.

D. RIP TASKS

Real-Time Interrupt Processors (RIP) are the core of Televent interrupt processing capability. These tasks are used to set up and respond to all interrupts generated by the EMR 760, 2763 and 2765. It is the only standard Televent task which makes calls to the 760, 2763 and 2765 drivers.

The number of RIP tasks which a user may have is dependent on the particular system. Usually, it is advantageous to minimize the number of RIP modules; however, the only restriction on the use of RIP modules is that all processing for a given interrupt be contained in one RIP task. Thus, for one data stream with five interrupts, the user could use five separate RIP tasks. Conversely, two data streams may share one RIP tasks.

RIP modules fully utilize the capabilities of the 760, 2763 and 2765 drivers and, thus, allow AST's and direct interrupt dispatching from the driver to the RIP modules.

It is important to realize that the RIP's are self-sufficient during real-time operation. Once a data stream's interrupts are initiated, the AST's and interrupts will be responded to, regardless of the state of the TOP and TEL tasks. This allows TOP and TEL to be suspended and other programs to be executed. The user must only be concerned that the software priorities of these RSX programs are less than the priorities of the RIP's.

E. SETUP TASK

The SETUP task provides a method of converting operator-specified parameters into the format required by various computer-controlled telemetry equipment. Each task is structured in an identical format, thus providing a commonality for operator communications, system integration and expansion. A separate SETUP task is required for each different model of telemetry equipment. Each SETUP task has one or more associated data blocks. These data blocks contain device dependent information and storage regions, thus allowing one SETUP task to be used on multiple units (of the same model).

Other features of a SETUP task include:

1) Provides syntax and data value error checking on all operator entries. Error messages are output to the operator's console.
2) Transmits the proper commands to the front-end equipment.

F. RUN TASKS

RUN tasks are a form of utility task. Although Televent provides several standard RUN tasks, the principal purpose is to provide the user with a simple method of integrating his own utility software into the system. RUN programs are usually executed as low priority non-real-time functions.

A standard "shell" is provided which allows an RSX program to become a Televent RUN program.

There are several advantages to using a RUN program rather than an RSX program. First, all operator I/O may be performed via TOP. This not only simplifies I/O, but also allows the use of the indirect command file processor. The second advantage is that the RUN "shell" provides a standard method of reporting errors to the operator, thus simplifying the user's effort. Finally, initiating an RSX task from the same console being used by a Televent operator usually requires Televent be suspended (via the .ID command). Thus, the RUN directive simplifies the operator's actions by reducing the number of entries.

G. CODAB

CODAB is the abbreviation for the Configuration Data Block. This module consists of a number of tables and data blocks which completely describe the specific hardware and software configuration and resources available to the Televent system. The CODAB is implemented as a system common area. Every Televent task has access to this common area.

The advantage of the CODAB is that it allows changes in the configuration to be made with minimal impact on other Televent tasks. RUN program or CONNECT routines may be integrated in the system without changing any code in TEL. The CODAB provides a convenient reference for the system engineer for accessing hardware-specific information pertaining to the system. Figure 5 lists the items contained in the CODAB.

Special attention should be given to two data areas reserved in the CODAB. The first is a dynamic pool of core which is allocated by Televent to requesting tasks as needed. This dynamic of memory reduces the total memory used and also allows flexibility in expanding a system. Televent software is written to utilize this memory pool. When system expansion requires more dynamic memory, the size of the pool in CODAB can be increased without changing Televent software. This dynamic memory is also available to user software.

The second area of core is the Task Communication Region. This is used to pass register contents and other parameters between Televent tasks. It provides the fastest possible communication between RSX tasks. This area can be easily increased to provide a communication area for special system dependent functions.

H. SETUP AND END EXECUTIVE DIRECTIVES

The SETUP command is used to specify a hardware unit to be set up, or a a software sequence to be set up. The SETUP and END directives are seen in pairs. The SETUP directive informs TEL the user wishes to specify "setup" information for a particular piece of hardware or software. The END directive informs TEL the user has completed his setup sequence. The SETUP directive must be accompanied by a UNIT NAME, which describes the hardware or software being set up. In the event there are more than one of the same type UNITS in a system, a UNIT NUMBER must accompany the UNIT NAME. If a unit number does not accompany the unit name, a unit number of one (1) is assumed.

Example:

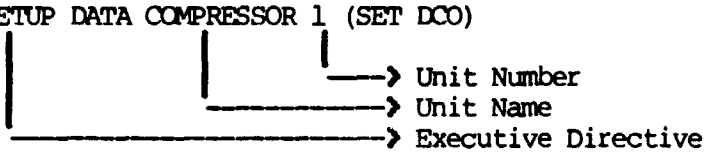


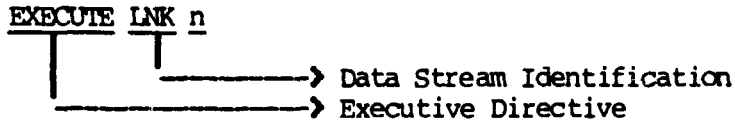
FIGURE 5. CODAB CONTENTS

LIST	DESCRIPTION
Unit Name List	List of all front-end equipment and the corresponding SETUP task.
Data Stream Name List	List of all allowable data streams with pointers to other applicable tables.
Background Program List	List RUN tasks.
Connect Program List	List of allowable CONNECT routines.
Master Interrupt Table	Defines by stream, all system interrupts.
Execute and Halt Source List	Buffers to be transferred to the front end on the EXECUTE and HALT commands.
Execute and Halt Task Tables	Tasks to run on the EXECUTE and HALT commands.
I/O Status Data Blocks	Defines status conditions to be checked out before transferring data to the front end.
2763 and 760 Data Blocks	Data blocks used to control 2763 or 760 I/O.
Memory Resources Allocation Buffer	Area of core dynamically allocated to requesting Televent task.
Task Communication Region	Area of core reserved for each user to pass parameters between tasks.

There is a setup driver task associated with each UNIT in the Televent system. The setup driver accepts operator-specified parameters which are required to set up a specified UNIT.

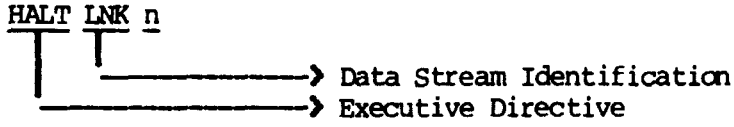
I. EXECUTE AND HALT DIRECTIVES

The EXECUTE directive is used to initiate data acquisition. The HALT directive is used to terminate data acquistion mode. The event stimulate HALT INT halts acquisition, but leaves the system in acquisition mode. The basic format of the EXECUTE directive is:



Example: EXECUTE PCM 1

The basic format of the HALT directive is:



Example: HALT PCM 1

J. CONNECT AND DISCONNECT DIRECTIVES

The CONNECT and DISCONNECT directives are usually used as a pair. The CONNECT directive provides linkage between a telemetry stimulus (EVENT) and a software response. The format of the CONNECT directive is:

CONNECT PROGRAM TO EVENT

where CONNECT is the executive command; PROGRAM is the name of the software response routine which performs some predefined function(s) in response to the occurrence of the specified specified EVENT; TO is an optional conjunction which has no functional significance other than to provide syntactical continuity; and EVENT is the name or identity of a telemetry stimulus. The identify of a telemetry EVENT is established at system configuration time in CODAB, the Configuration Data Block.

The CONNECT directive causes the software response to be run at a hardware priority. A variant, the SCONNECT, will cause the software response to be scheduled at a software priority level.

The DISCONNECT directive is used in conjunction with the CONNECT directive. The purpose of the DISCONNECT directive is to sever the software interface to a user's program previously connected to this EVENT. The basic format of the DISCONNECT directive is:

DISCONNECT EVENT

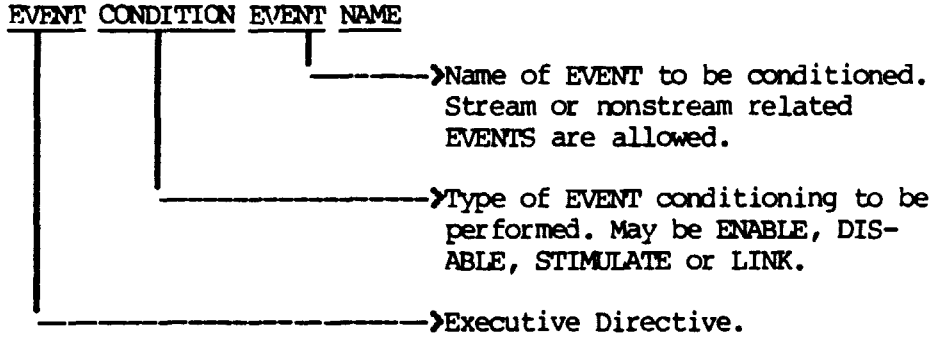
where DISCONNECT is the basic executive command, and EVENT is the name of a telemetry stimulus (i.e., interrupt).

K. EVENT DIRECTIVE

The EVENT directive is provided to allow user control of EVENT conditions. The EVENT conditions the user may control are:

1) EVENT ENABLE
2) EVENT DISABLE
3) EVENT STIMULATE
4) EVENT LINK

The basic format of the EVENT directive is:

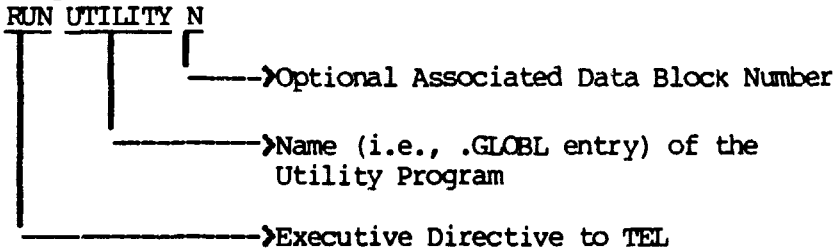


The ENABLE condition simply allows the specified EVENT to take place. The DISABLE condition prevents the specified EVENT from taking place. Usually an EVENT is associated with an external signal. Sometimes, it is desirable to emulate or synthesize an external signal; the STIMULATE condition provides this capability. The STIMULATE condition not only causes the specified EVENT to be enabled, but causes the EVENT to take place. The LINK is used only for non-stream related events and causes the linkage between the 760/2765 driver and the software module to be established.
Example: EVENT STIMULATE PCM START INTERRUPT

L. RUN DIRECTIVE

The RUN Executive Directive to TEL permits execution of "background" tasks under control of TEL. A Televent background program is defined as a utility program which has no time constraints and can be executed at a relatively low priority.

A background program is incorporated into the Televent system by simply defining the name of the task in the appropriate section of the system Configuration Data Block, CODAB. Although Televent provides some basic utility functions, the RUN directive is provided primarily to provide the user with an easy method of incorporating his utility programs into the Televent system. The basic format at the RUN directive is:



Example: RUN MTD ; MAG TAPE DUMP

5.4.2 DPDO - Setup Driver for Parallel Data Output - the purpose of this program is designed to decode user information for setup of the input Interface Data Block with a user selected Data Output Stream. The following data is established by DPDO:

A. Frame Length = N (FLE)
   where N = 0 to 32767
B. Buffer Length = N (BLE)
   where N = 0 to 32767
C. Frame Merge = N (FME)
   where N = 0 to 127
D. Buffer Merge = Data (BME)
   Data = S/wn (software merge of "n" words)
   = H/wn (hardware merge of "n" words)
   = None
   where "n" = 0 to 63
E. Buffer Preface = N (BPR)
   where N = 0 to 247
F. Buffer Appendix = n (BAP)
   where N = 0 to 255
G. External Start = Data (EST)
   where Data = Allow (ALL)
   Data = Inhibit (INH)
H. Buffer ID = Data (BID)
   where Data = 1 to 4 Alphanumeric Characters

5.4.3 D714 - 714 Data Compressor Set up Driver

A. The objective of this program is to decode and process directives that condition either the static stores or the compressor memory. All of these directives act together to setup algorithm definitions within the compressor for processing real-time mainframe and sub-frame data.
B. D714 is invoked by the following during the control of the telemetry executive:

SETUP	DATA COMPRESOR	(long form)
SET	DCO	(short form)

C. Directive Index -

ABBREVIATION	LONG FORM	USAGE *
AEN	ALARM ENABLE	M
BCH	BIT CHANGE	M
BMA	BIT MATCH	M
CLE	CLEAR	C
CSU	CUMULATIVE SUM	M
DEL	DELETE	M
DLI	DELTA LIMIT	M
DNU	DEVICE NUMBER	C
DSL	DELTA SLOPE	M
EAR	ENABLE ARM	S
EME	ENABLE MEASUREMENT	M
FAL	FORCE ALLOW	M
FAR	FORCE ARM	S
ILI	IN LIMIT	M
LID	LINK IDENTIFICATION	M
MEA	MEASUREMENT	C
MMA	MINIMUM MAXIMUM	M

NBI	NO BIT MATCH	M
NSE	NTH SEQUENTIAL	M
QLI	OUT LIMITS	M
PSE	PORT SELECT	M
SFO	SEARCH FORCE	M
SIN	STATUS INPUT	M
TEN	TIME ENABLE	S
THR	THROUGHPUT	S
TNU	TAG NUMBER	M
TPO	THIRD POINT	M
UPD	UPDATE	C

* USAGE CODES: M - Measurement related
C - Set up control
S - Static Store functions
(See NASA-LRC.POA E-6942 Statement of Work, Appendix B, for detailed explanations)

5.4.4 ATPINI - Tape Initializer for RSX

Purpose - This program initializes magnetic tapes on Telemetry runs.

A. Description

TPINIT (MTPINT) are entry points. After saving all registers, ATPINT goes to the routine MTUNIT to get the FWA of the logical unit to be initiated. On the error, exit is taken from ATPINI. The first drive in ATPINI and ARIMTF is then given this address. The internal subroutine, RWD, is used to ask if the mag tape is to be rewound. If so, it does the action next; the program asks for the four-character ID which is put into IDBUF and DCBUF. The reel count of both is reset to one. The program then resets the mag tape calling sequence and the EOT, and drive off line switches in ARIMTF.

The program then gets the common ID header and the comments for the first tape drive and puts these to tape using the subroutine, MOVBUF. When an input of END in the first three characters is encountered, the program stops reading comments.

The program now asks if a second drive is to be used in the run after it clears the flag, TAPE2. If the operator, via the system input device, enters "NO", the program exits. On "YES", TAPE2 and the reel count in IDBUF (located in ARIMTF) are incremented to reflect two tapes. The subroutine, MTUNIT, is asked for the logical unit FWA which is compared against the first tapes log unit TWA. If equal, an error exit is taken from ATPINI with R0=3. Otsherwise, this log unit is stored in TPINT2 in ARIMTF. The program then asks if this drive is to be rewound or not, before writing the ID record to tape.

All operator communication in this program which requires a "YES" or "NO" answer will loop until the operator enters the first digit correctly. No default condition.

Any mag tape I/O error will result in an error exit with R0 containing the expanded mag tape error status.

B. Operator Communications

When the system device is the keyboard, the following messages may be issued by ATPINI:

1) "ENTER RUN ID" - the operator is to enter a four character ID that will appear in all records.
2) "REWIND TP?" - the operator responds "Y" to rewind the current tape being intiated, or "N" for no rewind.
3) "TWO TAPES?" - the operator answers "Y" if the run will be made with tape switching, and with "N" for a single tape run.
4) "ENTER COMMON HDR" - the operator responds with up to 80 characters of header information. This information will appear in the ID record at the beginning of each tape.
5) "ENTER COMMENTS, END=NONE" - the operator enters comments which are written to tape. When he wishes to terminate the comments, the entry of "END" as the first three characters of the input will result in the program to stop asking for comments.

c. Error Conditions

1) The program, MTUNIT, did not get a satisfactory logical unit number from the operator. The error code on the keyboard will be 2.
2) The first and second tapes on a run have the same logical unit specified. The error code on the keyboard will be 3.
3) If a mag tape I/O error occurred, the error code will be one of the errors specified by ARDTMT. See Appendix A.

APPENDIX A

STATUS (OCTAL)	DESCRIPTION
000000	Specified action has been started and is still in progress.
000001	The specified tape movement or initialization has been completed and the transport is ready.
100001	The specified hardware controller or drive is busy. If possible, the user program should repeat the current I/O or movement request.
100002	A write protect condition has been detected during a WRITE, ERASE, or WRITE FILE MARK.
100003	Beginning of tape (BOT, LOAD POINT) has been detected.
100004	An unexpected command REJECT has occurred. This status indicates that the transport is probably off line.
100005	A hardware File Mark has been detected during a READ, FORWARD RECORD or ERASE.
100006	The End of Tape (EOT) marker has been detected. The data record has been written in its entirety. Each command to the drive after an EOT will be flagged with an EOT code until the reflector is passed with the drive in reverse (backspace or rewind or unload).
15NNNN	A Data Length error has occurred during a READ operation. The number of words transferred is truncated to the least significant 12 bits (max. value of 4095) and appears in the lower 12 bits of the word on too long errors. On short record the complete record is read and the 12 lower bits will equal the word count. Note that the 12 bits will equal the record word count when the read word count equalled zero.
16NNNN	A parity error has occurred during a READ/WRITE operation. The lower 12 bits again contain the word number.
17NNNN	A transfer error has occurred during a READ/WRITE operation. This will normally be caused by noise in the inter record gap or a bus grant late to the controller. The lower 12 bits contain the number of words transferred.

5.4.5 MTDUMP - Mag Tape Dump Program

Purpose - To provide facilities for tape positioning, output formatting, and length specification while dumping a magnetic tape. This program will dump any drive on the system.

Calling Sequence - RUN MTD

a. Description

MTDUMP provides operator controlled functions in DECKEY format to control the dumping of magnetic tape. Upon entry the operator must identify the system logical unit he is dealing with. Once this numeric value is entered, all commands will be directed to that drive. The operator is requested to define the buffer size to be utilized for mag tape input. The maximum buffer size is 4096 words decimal. This can be easily changed via an equate if necessary. The drive reads any length records. At this point the program will ask for the FUNCTION. Each is described in the section below.

DIRECTIVE	KEY	DATA FIELD	DESCRIPTION
REWIND	REW	N/A	Rewinds the input tape to load point (BOT).
FIND ID	FID	1 to 4 characters in the following format:	Searches the source tape for a match on the ID as given to MTDUMP.
		IIII = identifier	Note: Only header/comment record ID's are compared to the user specified ID.
FORWARD FILE	FFI	1 to 32,768	Spaces forward N files where the current position is defined as zero
FORWARD RECORD	FRE	1 to 32,768	Space forward N records from the current records.
BACKSPACE FILE	BFI	1 to 32,768	Spaces backward N files from the current location. The tape will be positioned in front of the file mark.
BACKSPACE RECORD	BR	1 to 32,768	Backs the tape up N records.
OCTAL	OCT	N/A	Request output of data in octal. This is default.
DECIMAL	DEC	N/A	Request output of data in decimal.

PRINT	PRI	Blank or 0 to 32,768 where 0 or blank will be all of file.	Print the specified number of records on the system print device.
EXIT	EXI	N/A	Return to the system executive program.

Note: The operator should be aware of DECKEY's need for two blanks to terminate a single word command. For example:

```
PRINT 1
BRE   2
```

Header records as built by MGTIN will be printed as ASCII characters whenever they are encountered. MTDUMP recognizes header records by the following criteria:
1. 40 or less characters, and
2. bits 7 and 15 set

A number of error messages and operator messages are described in paragraphs below.

B. Operator Communication

1) "MTDUMP:" Set SW = 0 to RUN, SW = 1 to TERM FUNCTION - this is to notify the operator that he may terminate a PRINT function by changing the switch register to a binary 1. This message will not be output when the conditional assembly deleting references to the switch register is utilized.
2) "FUNCTION IS:" At this point the operator should enter the desired function.
3) "RUNID FOUND:" - this notifies the operator that the ID he wanted searched for has been found. Message 2 above will follow immediately.
4) "INSUFFICIENT CORE:" - MTDUMP could not get the core required for its read buffer. The program returns to the executive after this message.
5) "ILLEGAL CMD:" - The command entered was illegal or had an illegal format. Message 2 above will follow immediately after this message.
6) "PARITY OR TRAN ERR:" - This message occurs when the mag tape could not be read successfully. The operator has three options to type in:
   a. "C" - continue and ignore the error.
   b. "A" - abort this command and go back to ask for FUNCTIONS.
   c. "R" - retry which will back space the tape and attempt to read again.
7) "MT.BSY." - This means the drive is probably off line. The program will loop until the operator enters a "C" to retry the last command again, or an "A" to abort the current function and output message 2 above.
8) "ENTER MAX BUF SIZ" - The operator is requested to enter the maximum buffer space that can be used to read tape into. This normally should be from 1 word to 4100 words.

C. Dig Mag Tape Dump (MTD) Procedure

Boot up system.

```
>RUN TOP
>TELEVENT -11
RDY FOR EXEC CMDS
TEL>RUN MTDUMP      (program to do a mag tape dump)
ENTER MAG TAPE LOG UNIT NBR 0
ENTER MAX BUF SIZ
TEL>4096            (always 4096)
 MTDUMP:  SET SW=0 TO RUN,SW=1 TO TERM FUNCTION
 FUNCTION IS:
TEL>REW             (rewinds tape)
 FUNCTION IS:
TEL>FRE 200         (frees as many files as you wish)
 MTDUMP:  SET SW=0 TO RUN,SW=1 TO TERM FUNCTION
 FUNCTION IS:
TEL>PRI 1           (prints number of files specified)
 RECORD NO.   201
   0> 177776 004551 000001 046503 030520 000011 004540 060000
   8> 000001 000004 007777 177772 024131 000004 007777 177772
  16> 024211 000004 007777 177772 024431 000004 007777 177772
  24> 024511 000004 007777 177772 024611 000004 007777 177772

      ETC.
```

5.4.6 CDU - Comment Dump for Mag Tape Files

A. Purpose

To purpose a mag tape file on a logical unit specified by the user and print the comment records on the line printer, (output will default to the keyboard device, if the line printer has not been enabled by the .EL command). A specific file may be selected by entering the four-character ID (which preceeds each record on a tape file) or a carriage return can be entered to indicate no file selection.

B. Calling Sequence

RUN command followed by "CDU".
Registers will contain the following when this program is entered:

R0 = FBA of the RUN directive
R5 = FWA of the associated data block

C. Description

This program will process any STANDARD TELEVENT-11 MAG TAPE. The tape can contain more than one file. Before the comments are listed, the user must specify certain information to condition the execution of the program. These entries are described in the following sections.

1) Logical Unit Number

The program will display the message:

ENTER MAG TAPE LOG UNIT NBR

The user should respond with logical unit number of the drive on which the tape is to be processed. This will not be changeable during program execution. If the number entered cannot be found in MRTMT (the Mag Tape Data Block) the following message will be displayed and the program terminated:

INVALID LUN - RUN ABORTED

2) ID of File

Since this program has the capability of searching a multifile tape for a selected ID, an entry is requested in the form:

TYPE 4 CHAR ID

The user may respond in three different ways depending on his needs and the point at which the message is emitted.

OPTION 1 - ACTUAL ID

If a multifile reel is used as input and a particular file on that reel is to be processed and not any other files preceeding it, the user should enter four-character ID associated with that file. The tape will be searched until that ID is found or until the EOT occurs. Once the first data record is encountered with the entered ID, the program will ask for a new ID entry.

OPTION 2 - CARRIAGE RETURN

When a single file reel is the input source, or a multifile reel and the file ID or the location of the file is not known, option 2 should be used. Under this option when a "carriage return" is entered, the program will search the tape for the first comment record, without regard to the ID. As in option 1, once the first data record is encountered after printing the comment records, the program will ask for a new ID.

OPTION 3 - EXIT

This entry should be made when the user no longer desires to process any more files or tapes. The word "EXIT" causes the program to execute end-of-job logic and returns control to TELAX.

3) Premature End of Tape

When the program has been given either a carriage return or an actual ID and it reaches the END OF TAPE before finding the comment record, the following message is displayed:

EOT - ID NOT FOUND

This indicates to the user there are no more files or records remaining on the tape, and the program cannot print any comments as desired. The program then executes the same logic as if "EXIT" was entered.

D) Error Conditions

1) PREMATURE EOT

2) INVALID TAPE FORMAT

When the program recognizes a comment record code but the record size is not standard, R0 is loaded with a -1 and the error return is made to TELAX. The contents of R0 are displayed to the user as an error code.

3) RETRY, TERMINATE OR CONTINUE

If the message is displayed, refer to DRTMT documentation for an explanation of the error code.

E) Messages
1) ENTER MAG TAPE LOG UNIT NBR - see section 5.4.6.c.1
2) INVALID LUN-RUN ABORTED - see section 5.4.6.c.1
3) TYPE 4 CHAR ID - see section 5.4.6.c.2
4) EOT -ID NOT FOUND - see section 5.4.6.c.3
5) 177777 - see section 5.4.6.d
6) RETRY, TERM OR CONT - see section 5.4.6.d

F. Example of CDU
1) Boot up system
2) RUN TOP
3) TEL>RUN CDU
ENTER MAG TAPE LOG UNIT NBR
TEL>0
TYPE 4 CHAR ID
TEL>CMP1 (enter four-character file ID)
At this point the tape will begin dumping its comment file.

5.4.7 DCMD - Compressor Memory Dump

A. Purpose
To read the memory of the 714-02 Data Compressor and print the octal contents on the listing device. This is a run program which be excuted in non-real time only.

B. Calling Sequence
RUN CMD for CMP 1

C. Technical Description
The memory of the 714-02 will be accessed and printed using either of two options. The option will be indicated by the response to this message:

DO YOU WISH TO DUMP ALL COMPRESSOR MEMORY (Y or N)?

If "Y" is the user response, the entire memory will be printed, and the program will then return to the option question for another entry.

If "N" is the user response to the option query, then the user must provide further information to these messages:

ENTER BEGINNING OCTAL ADDRESS (BBBBBB):
ENTER ENDING OCTAL ADDRESS (EEEEEE):

The user may respond with those addresses he wishes to be printed. Once the addresses are validated those locations will be printed, and the message will be repeated. When the user has finished printing all he wished to see, typing "EXIT" will terminate the run. Placing a one (1) in the lower bit of the switch register will also terminate printout.

PRINT FORMAT
NNNNNN XXXXXX XXXXXX XXXXXX XXXXXX
XXXXXX XXXXXX XXXXXX XXXXXX

Where NNNNNN is the compressor memory address in octal and XXXXXX is the contents.
NOTE: Illustration above appears on two lines because of form size. In actual printing, eight words will appear on the same line.

5.4.8 WRM - Write File Mark

A. Purpose
To write a double End of File Mark on the digital Mag tape after recording is completed.

B. Calling Sequence
RUN WFM

C. Example
```
TEL>RUN WFM
RUN WFM
ENTER MAG TAPE LOG UNIT NBR
TEL>0
```

6.0 Data Base (Program Files)

6.1 Data Base Format
NASA has specified the data base have the following formats

6.1.1 Set up the Compressor Data Stream and Parallel Data Output Driver.

6.1.2 Set up the Data Compressor, including measurement number, tag number and algorithm. This alerts the compressor to what channels to act upon.

6.1.3 Connect Mag Tape Formatter to Compressor Blockend Interrupt. This writes comments (data base) onto the mag tape.

6.1.4 Specify Run ID (compressor stream).

6.1.5 Add on comment file of two lines per sensor:
A. Stating tag number, sensor ID, sensor description and engineering unit.

B. Stating tag number and engineering coefficients. (B,M).
Note: These comments must be entered in the order the sensors are listed in the first part of the data base. An example is given in the following section.

6.2. Example of Data Base Setup

6.2.1
```
SET CMP     ------- Setup Compressor Stream (Data Output Driver)
FLE = 48    ------- Frame Length = words per frame
BLE = 50    ------- Buffer Length = frames per buffer
BID = CMP1  ------- Buffer ID = CMP1
BPR = 1     ------- Buffer Preface = 1
EST = INH   ------- External Start = Inhibit
END         ------- End = Compressor Stream Setup completed
```

6.2.2
```
;
SET DCO       ------- Setup Data Compressor
CLE = 1       ------- Clear number 1 link
DNU = 0       ------- Device Number
FAR = ON,EXT  ------- Force Arm = ON,EXT
TEN = ON      ------- Time Enable
LID = 1       ------- Link ID = 1
;
MEA = (W1)    ------- Measurement = ADC channel (a measurement greater
                      than 100 means the channel is turned off)
PSE = 1       ------- Port Select = 1
TNU = 46      ------- Tag Number = assigned number
FAL = ON      ------- Force Allow = ON
MMA = ON,4600 ------- Algorithm = min.max.
MEA = (W999)  ------- After all data channels to be used have been
PSE = 1               entered, always assign the last measurement the
TNU = 999             number 999. This key NASA's program that this
MMA = OFF             ends the data base and begins the comment file.
END ------- End = DCO Setup complete
```

6.2.3 SCON RTMTF CMP BIN — Connect the mag tape formatter with the compressor Blockend Interrupt.
0 — 0 = Mag tape device number
N — N = No, do not rewind tape
CMP1 — CMP1 = Run ID (Compressor Stream), this writes data base records onto the mag tape.

6.2.4 Add on a sensor comment file of two lines per sensor in the following format:

TNU	SENSOR ID	DESCRIPTION	E.U.
46	04E170	L S SHAFT TORQUE	N-M
46	-1.15E+05	+5.65E+01	
47	04E172	L S SHAFT TORQUE	N-M
47	-1.13E+05	+5.53E+01	

TNU B M - Coefficients

Note: The first line MUST have a field of four (4) for the tag number, then two (2) spaces; a field of six (6) for the sensor ID, then two (2) spaces; a field of twenty-five (25) for the sensor description, then two (2) spaces and a field of five (5) for the engineering units.
The second line MUST have a field of four (4) for the tag number, then two (2) spaces; a field of nine (9) for the B coefficient, then two (2) spaces and a field of nine (9) for the M coefficient.

6.2.5 After the last sensor comment, always end file with the following:

```
1981              PLUMBROOK STATION        MOD 0 (year, site & WTG)
;
;
@TI:   (allows entering comments through KB)
9999   (tells NASA program this is the end)
END    (comment file complete)
N      (Are there two tapes? Always no)
;
SCON MTFIN CMP HIN  (connect mag tape finish to Halt Interrupt)
EXE CMP (Execute Compressor Stream)
.KB
```

6.3 Coefficient Calculation

6.3.1 Basic Formula $y = mx + b$
A. To get the value of m:
1) If the discriminator voltage span is 10 volts, divide the full scale engineering value by 4096.
2) If the discriminator voltage span is 5 volts, divide the full scale engineering value by 2048.
B. b will be the number added to the mx value to give the desired value.

C. To assign the correct sign value use the following rules as a basis:
   1) If the engineering signal increases in a positive direction (with respect to discriminator voltage), b is negative and m is positive.
   2) If the signal increases in a negative direction, b is positive and m is negative.

6.3.2 Non Detranslated Channels
$y = mx + b$ $\quad b = -\#$ $\quad m = +\#$

A. Example 1
Discr voltage = 0 - +5 volts = 0 - 4000 PSI

A-D Counts	Discr	Signal	
4096	UBE +5	4000	$m = \frac{4000}{2048} = 1.953E0$
2048	CF 0	0	$b = -4000 = -4.0E3$

To verify E.U. = $y = mx + b$
UBE (1.953)(4096) - 4000 = 8000 - 4000 = 4000 PSI
CF (1.953)(2048) - 4000 = 4000 - 4000 = 0 PSI

B. Example 2
Discr voltage = -5 - +5 volts = 0 - 100 MPH

A-D Counts	Discr	Signal	
4096	UBE +5	100	$m = \frac{100}{4096} = 2.44E-2$
2048	CF 0	50	$b = 0$
0	LBE -5	0	

To verify E.U. = $y = mx + b$

UBE (2.44E-2)(4096) - 0 = 100 MPH
CF (2.44E-2)(2048) - 0 = 50 MPH
LBE (2.44E-2)(0) - 0 = 0 MPH

6.3.3 Detranslated Channels $\quad y = mx + b$

A. Example 1
Discr voltage = 0 - -5 volts = 0 - 4000 PSI

A-D Counts	Discr	Signal	
4096	UBE +5		$m = \frac{4000}{2048} = -1.953E0$
2048	CF 0	0	
0	LBE -5	4000	$b = +4000 = 4.0E3$

To verify E.U. = $y = mx + b$
CF (-1.953E0)(2048) + 4000 = -4000 + 4000 + 0 PSI
LBE (-1.953E0)(0) + 4000 = 0 + 4000 = 4000 PSI

B. Example 2
Discr voltage = +5 - -5 volts = 0 - 100 MPH

A-D Counts	Discr	Signal	
4096	UBE +5	0	$m = \frac{100}{4096} = -2.44E-2$
2048	CF 0	50	b = 100 = 1.02E2
0	LBE -5	100	

To verify E.U. = y = mx + b

UBE (-2.44E-2)(4096) + 100 = -100 + 100 = 0 MPH
CF (0.0244)(2048) + 100 = -50 + 100 = 50 MPH
LBE (-.0244)(0) + 100 = 0 + 100 = 100 MPH

For $\pm\frac{1}{2}$ G
0 - +5 volts = 0 - .5 G

A-D Counts	Discr	
4096	UBE +5	$m = \frac{.5}{2048} = 2.44E-4$
2048	CF 0	b = -.5 = -5.0E-1
0	LBE -5	

For ±3000 PSI
0 - +5 volts = 0 - 3000

A-D Counts	Discr	
4096	UBE +5	$m = \frac{3000}{2048} = 1.4648$
2048	CF 0	b = -3.00E3
0	LBE	

OR
-5 - +5 = 0 - 3000

A-D Counts	Discr	
4096	UBE +5	$m = \frac{3000}{4096} = .732$
2048	CF 0	b = 0
0	LBE -5	

6.4 Program ID Scheme

6.4.1 The first four or five letters in the program name before the period (.) identifies the type of wind turbine generator.

6.4.2 The two letters after the period indicate the wind turbine site.

6.4.3 The number after the site identifier is the program version. The higher the number, the later the version.

PB = Plumbrook CL = Clayton PR = Puerto Rico
GH = Goodnoe Hills HA = Hawaii BI = Block Island
CA = California BN = Boone

6.5 Creating a New Data Base

6.5.1 Boot the system (refer to Section 5.1)

6.5.2 Run $EDI (refer to Section 5.3.2)

6.5.3 When creating a new data base, always start it with a semicolon and the program name along with any useful dates or information.

Example:

```
>EDI MOD0.PB5
(CREATING NEW FILE)
INPUT
   ; MOD0.PB5     THIS PROGRAM DOES SUCH AND SUCH
                  APRIL 1980 to _____
```

6.5.4 Follow the data base format given in Section 6.1 for the remainder of the setup.

6.6 Debugging a Newly Created Data Base

```
>RUN TOP
TELEVENT -ll
READY FOR EXEC CMDS
>RUN WFM
ENTER MAG TAPE LOG UNIT NBR 0
READY FOR EXEC CMDS
>.IC
>.LI
>@FILE NAME
```

At this point the program begins to setup listing each command in the program. If an error is in the program, it will cease listing the program at that point at which time corrective measures should be taken. (Refer to section 5.3.2)

6.7 Program ID Listing

MOD0

MOD0.PB - Used for taking realtime data for the Plumbrook Mod0 WTG.
December 1, 1980 - March 30, 1981.

MOD0.PB1 - Used for taking realtime data for the Plumbrook Mod0 WTG.
April 10, 1981 - August, 1981.

MOD0.PB2 - Used for taking realtime data for the Plumbrook Mod0 WTG.
October, 1981 - present.

MOD0.PB3 - Used for realtime data collection
October, 1982 - February, 1983.

MOD0.PB4 - Used for data collection
February, 1983 - present.

MD0.PBA - Used for playback
February, 1983 - present

MD0.PBB - Used for playback
February, 1983 - present

MOD0.VAN - Plumbrook Mod0 WTG weathervaning.

MOD0.PS1 - Used for taking playback data from specific data channels from analog tapes for the Mod0 WTG (pass #1).

MOD0.PS2 - Used for taking playback data from specified data channels from analog tapes for the Mod0 WTG (pass #2).

MOD0.TC1 - For playback of Plumbrook Mod0 WTG, tip control blades (pass #1).

MOD0.TC2 - For playback of Plumbrook Mod0 WTG, tip control blades (pass #2).

MOD0A

MOD0A.CL1 - For playback of Sair analog tapes from Clayton, New Mexico, 1980 (aluminum blades).

MOD0A.CL2 - For playback of Sair analog tapes from Clayton, New Mexico, 1981 (short stub blades).

MOD0A.CL3 - For playback of Sair analog tapes from Clayton, New Mexico, 1981 (fiberglass blades).

MOD0A.CL4 - For playback of Sair analog tapes from Clayton, New Mexico, 1982. (variable pitch).

MOD0A.BI1 - For playback of Sair analog tapes from Block Island, Rhode Island, 1980 (aluminum blades).

FUEL.BI1 - For playback of fuel study tapes from Block Island, Rhode Island, February, 1982 to ___.

MOD0A.BI2 - For playback of Sair analog tapes from Block Island, Rhode Island, 1981 (wooden blades).

MOD0A.BI3 - For playback of Sair analog tapes from Block Island, Rhode Island, 1982 (wooden blades).

MOD0A.PR1 - For playback of Sair analog tapes from Culebra, Puerto Rico, 1980 (aluminum blades).

MOD0A.PR2 - For playback of Sair analog tapes from Culebra, Puerto Rico, 1981 (reinforced aluminum blades).

MOD0A.PR3 - For playback of Sair analog tapes from Culebra, Puerto Rico, July, 1981 - present (wooden blades).

MOD0A.PR4 - For playback of Sair analog tapes from Culebra, Puerto Rico, 1982, (wooden blades).

MOD0A.HA1 - For playback of Sair analog tapes from Hawaii, 1980 (wooden blades).

MOD0A.HA2 - For playback of Sair analog tapes from Hawaii, 1981 (wooden blades).

MOD0A.HA3 - For playback of Sair analog tapes from Hawaii, 1982 (wooden blades).

MOD1

MOD1.BN2 - For playback of Sair analog tapes from Boone, North Carolina.

MOD1.BN3 - For playback of minivan tapes, pass number 1, from Boone, North Carolina.

MOD1.BN4 - For playback of minivan tapes, pass number 2, from Boone, North Carolina.

MOD2

MOD2.WA1 - For playback of WTG 1 tapes from Goldendale, Washington.

MOD2.GH2 - For playback of WTG 2 tapes from Goldendale, Washington, December, 1981.

MOD2.GH3 - For playback of WTG 3 tapes from Goldendale, Washington, October, 1981 to December, 1981.

MOD2.WA1 - For playback of WTG 1 tapes from Goodnoe Hills, Washington, January, 1982 to present.

MD2A.GH2 - For playback Mod2 WTG 2 December, 1981.

MD2B.GH2 - For playback Mod2 WTG 2 after February 15, 1982.

MD2D.GH2 - For playback of WTG2 tapes from Goodnoe Hills, Washington, October, 1982 to present.

MD2A.GH3 - For playback of Mod2 WTG 3, October, 1981 to December, 1981.

MD2B.GH3 - For playback of Mod2 WTG 3, after February 15, 1982.

MD2E.GH3 - For playback of WTG 3 tapes from Goodnoe Hills, Washington, from September, 1982 to present.

MOD4

MEDI.BOW - For playback of WTG 4 at Medicine Bow, Wyoming, for pass 1 only.

MEDI.BWW - For playback of WTG 4 at Medicine Bow, Wyoming, for pass 2 only.

PALM SPRINGS

BEND.IX1 - For reducing Bendix-SCE WTG data from Palm Springs, California up to September 1, 1981.

BEND.IX2 - For reducing Bendix-SCE WTG data from Palm Springs, California after September 1, 1981.

COOS BAY

COOS.BY1 - Playback from Coos Bay, Oregon, March, 1982 to ____.

7.0 Patchboard

7.1 Patchboard Layout

MOD0 INSTRUMENTATION

A 1,2	Low Speed Shaft
B 1,2	High Speed Shaft
C 1,2	Tip #2 Position
D 1,2	Tip #1 Position
E 1,2	Nacelle Direction
F 1,2	Tower X
G 1,2	Tower Y
H 1,2	Rotor Position (O.P.R)
J 1,2	Yaw Error
K 1,2	Nacelle Wind Speed
L 1,2	Yaw Torque 1
M 1,2	Yaw Torque 2
N 1,2	Alt Volts 0A
P 1,2	Alt Volts 0B
Q 1,2	Alt Volts 0C
R 1,2	Alt Current 0A
S 1,2	Alt Current 0B
T 1,2	Alt Current 0C
U 1,2	Alt Freq
V 1,2	Alt Power (KW)
W 1,2	Alt KVARS
X 1,2	Field Current
Y 1,2	Yaw ON CW
Z 1,2	Yaw ON CCW

ORIGINAL WEATHER

A 5,6	Wind Speed 30'
B 5,6	Wind Speed 90'
C 5,6	Wind Speed 150'
D 5,6	Wind Speed 195'
E 5,6	Wind Direction 30'
F 5,6	Wind Direction 90'
G 5,6	Wind Direction 150'
H 5,6	Wind Direction 195'
J 5,6	Air Temperature
K 5,6	Air Pressure

NEW MET TOWER

A 7,8	Wind Speed Tower 1
B 7,8	Wind Speed Tower 1A
C 7,8	Wind Speed Tower 2
D 7,8	Wind Speed Tower 2A
E 7,8	Wind Speed Tower 3
F 7,8	Wind Speed Tower 3A
G 7,8	Wind Speed Tower 4
H 7,8	Wind Speed Tower 4A
J 7,8	Wind Speed Tower 5
K 7,8	Wind Speed Tower 5A
L 7,8	Wind Direction Tower 1
M 7,8	Wind Direction Tower 1A
N 7,8	Wind Direction Tower 2
P 7,8	Wind Direction Tower 2A

Q 7,8	Wind Direction Tower 3
R 7,8	Wind Direction Tower 3A
S 7,8	Wind Direction Tower 4
T 7,8	Wind Direction Tower 4A
U 7,8	Wind Direction Tower 5
V 7,8	Wind Direction Tower 5A

OMNITEK VCO INPUTS

Control Room Mux 1 - A 13,14 through R 13,14

Control Room Mux 2 - S 13,14 through Z 13,14 and A 15,16 through H 15,16

Control Room Mux 3 - J 15,16 through Z 15,16

Control Room Mux 4 - A 17,18 through R 17,18

DISCRIMINATOR OUTPUTS

Bank 1 - (1-8) - A 21,22 through H 21,22

Bank 2 - (9-12) - J 21,22 through M 21,22

Bank 3 - (13-20) - N 21,22 through V 21,22

Bank 4 - (21-24) - W 21,22 through Z 21,22

Bank 5 - (25-32) - A 23,24 through H 23,24

Bank 6 - (33,36) - J 23,24 through M 23,24

Bank 7 - (37-44) - N 23,24 through V 23,24

Bank 8 - (45-52) - W 23,24 through Z 23,24 and
A 25,26 through D 25,26

Sabre VII Reproduce Outputs - (1-14) - A 29,30 through P 29,30

Time Code Input - - A 31,32

Amp/Delay Inputs - (1-4) - B 31,32 through E 31,32

Sabre III Reproduce Outputs - (1-14) - A 33,34 through P 33,34

Preston Amp Inputs - (1-24) - A 39,40 through Z 39,40

Amp Out - (1-4) - A 43,44 through D 43,44

Delay Out - (1-4) - A 45,46 through D 45,46

4130 Ref In - (1-4) - A 47,48 through D 47,48

4130 Data In - (1-4) - A 49,50 through D 49,50

4130 A/B Out - (1-4) - J 43,44 through M 43,44

4130 TSC Out - (1-4) - J 45,46 through M 45,46

Discriminator Bank Data In - (1-8) - S 43,44 through Z 43,44

Discriminator TSC In - (1-8) - S 45,46 through Z 45,46

BRUSH RECORD INPUTS

Brush 1 - AA 5,6 through HH 5,6

Brush 2 - JJ 5,6 through RR 5,6

Brush 3 - SS 5,6 through ZZ 5,6

Brush 4 - AA 7,8 through HH 7,8

Brush 5 - JJ 7,8 through RR 7,8

Brush 6 - SS 7,8 through ZZ 7,8

HP 85 - (1-24) - AA 11,12 through ZZ 11,12
(25-48) - AA 13,14 through ZZ 13,14

Analog Computer - (1-24) - AA 15,16 through ZZ 15,16

ADC INPUTS

(1-24) - AA 21,22 through ZZ 21,22
(25-48) - AA 23,24 through ZZ 23,24
(49-72) - AA 25-26 through ZZ 25,26
(73-96) - AA 27,28 through ZZ 27,28

Preston Amp Outputs - (1-24) - AA 39,40 through ZZ 39,40

Sabre VII Inputs - (1-14) - AA 29,30 through PP 29,30

Master Time Output - - AA 31,32

Hub Mux Outputs - (1-3) - BB 31,32 through DD 31,32

Nacelle Mux Outputs - (1-3) - EE 31,32 through GG 31,32

Control Room Mux Outputs - (1-4) - HH 31,32 through LL 31,32

Calibrator Output - - PP 31,32

Sabre III Record Inputs - (1-14) - AA 33,34 through PP 33,34

EXTERNAL SIGNALS TO WTG PANEL

External Input - UU 33,34

Blade Cal Volts - VV 33,34

Sig. Gen. Input - WW 33,34

O.P.R. Input - XX 33,34

O.P.R. Output - YY 33,34

Force Input - ZZ 33,34

SHORTING BARS

A 35,36,37,38 through Z 35,36,37,38

AA 1,2,3,4 through ZZ 1,2,3,4

AA 17,18,19,20 through ZZ 17,18,19,20

AA 35,36,37,38 through ZZ 35,36,37,38

AA 43,44,45,46 through ZZ 43,44,45,46

7.2 Patchboard Patching Procedure

7.2.1 FM Realtime Patching (Mod0)

a. Using a Patchboard form, fill in the necessary information giving the layout of the incoming signals and the desired location(s) to which each signal is designated to be patched. Patch accordingly.
b. Using a FM Patching (Realtime) form, fill in the necessary information giving the layout of the signals to be patched to the Detranslator and discriminator inputs. Patch accordingly.
c. Using a Sabre Recorder Patching form, fill in the necessary information giving the layout of the multiplexer signal outputs to be patched to the recorder input tracks. Patch accordingly.
d. Refer to section 7.3 for procedure on debugging and checking out patch board.

PATCHBOARD FORM

DISCR/ SIG #	I.D.	ADC	PATCH SOURCE	HP-85	A/D INPUT	OMNI INPUT	RESTON AMP #	BRUSH	SHORT BAR

FM PATCHING (REALTIME)

MUX	TO	AMP/DELAY IN (1-4)
Hub 1 (BB 31,32) Hub 2 (CC 31,32) Hub 3 (DD 31,32) Nac 1 (EE 31,32) Nac 2 (FF 31,32) Nac 3 (GG 31,32) Cntrl 1 (HH 31,32) Cntrl 2 (JJ 31,32) Cntrl 3 (KK 31,32) Cntrl 4 (LL 31,32)		1 (B 31,32) _____ 2 (C 31,32) _____ 3 (D 31,32) _____ 4 (E 31,32) _____

AMP OUT	TO	4130 REF IN
1 (A 43,44)		1 (A 47,48)
2 (B 43,44)		2 (B 47,48)
3 (C 43,44)		3 (C 47,48)
4 (D 43,44)		4 (D 47,48)

DELAY OUT (4130 A OUT)	TO	4130 DATA IN	TO	SHORTING BAR	TO	DISC BANK DATA IN (1-8)	
1 (A 45,46)		1 (A 49,50)		_____		_____	_____
2 (B 45,46)		2 (B 49,50)		_____		_____	_____
3 (C 45,46)		3 (C 49,50)		_____		_____	_____
4 (D 45,46)		4 (D 49,50)		_____		_____	_____

4130 A/B OUT	TO	DISC BANK DATA IN (1-8)	
1 (J 43,44)		_____	_____
2 (K 43,44)		_____	_____
3 (L 43,44)		_____	_____
4 (M 43,44)		_____	_____

4130 TSC OUT	TO	DISC BANK TSC IN (1-8)	
1 (J 45,46)		_____	_____
2 (K 45,46)		_____	_____
3 (L 45,46)		_____	_____
4 (M 45,46)		_____	_____

DISCRIMINATOR BANK COORDINATES

DATA IN	TSC IN
1. S 43,44	1. S 45,46
2. T 43,44	2. T 45,46
3. U 43,44	3. U 45,46
4. V 43,44	4. V 45,46
5. W 43,44	5. W 45,46
6. X 43,44	6. X 45,46
7. Y 43,44	7. Y 45,46
8. Z 43,44	8. Z 45,46

SABRE RECORDER PATCHING

PLUMBROOK
SABRE III PATCHING

OPTIONAL SIG (SOURCE)	TO	SHORT BAR	TO	SABRE III TRACK
Time (AA 31,32)		_____		1 _____ (AA 33,34)
Hub 1 (BB 31,32)		_____		2 _____ (BB 33,34)
Hub 2 (CC 31,32)		_____		3 _____ (CC 33,34)
Hub 3 (DD 31,32)		_____		4 _____ (DD 33,34)
Nac 1 (EE 31,32)		_____		5 _____ (EE 33,34)
Nac 2 (FF 31,32)		_____		6 _____ (FF 33,34)
Nac 3 (GG 31,32)		_____		7 _____ (GG 33,34)
Omni 1 (HH 31,32)		_____		3 _____ (HH 33,34)
Omni 2 (JJ 31,32)		_____		9 _____ (JJ 33,34)
Omni 3 (KK 31,32)		_____		10 _____ (KK 33,34)
Omni 4 (LL 31,32)		_____		11 _____ (LL 33,34)
				12 _____ (MM 33,34)
				13 _____ (NN 33,34)
				14 _____ (PP 33,34)
				15 Voice track

SABRE VII PATCHING:

TRK #	TYPE BOARD	SIGNAL DESCRIP.	SOURCE	INPUT VOLTAGE	CF	UBE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15	Voice trk					

7.2.2 FM Playback Patching (Mod0, Remote site)

A. Determine which multiplexer signals are to be played back along with the track numbers that the signals are recorded on.

B. Using the appropriate form for either a Mod0 (Plumbrook) tape or a SAIR tape, fill in the discriminator, sensor and ADC information.

   Note: This information is available in the appropriate site manual.

C. Using the above information, fill out a patchboard form and patch accordingly.

D. Using a FM Patching (Playback) form, fill in the necessary information giving the layout of the signals to be patched to the Detranslator and discriminator inputs. Patch accordingly.

E. When finished patching, refer to Section 7.3 for debugging and checkout procedure.

PLUMBROOK TAPES

CONFIG. DATES FROM _____ TO _____

RMU # _____ TAPE TRK _____ RMU # _____ TAPE TRK _____

FREQ	DISCR CH	SENSOR ID	ADC

FREQ	DISCR CH	SENSOR ID	ADC

SAIR TAPES

SITE _____ DATE _____

CONFIG. DATES: FROM _____ TO _____

RMU # _____ TRKS _____ _____ _____ RMU # _____ TRKS _____ _____ _____

FREQ	DISCR CH	SENSOR ID	ADC

FREQ	DISCR CH	SENSOR ID	ADC

FM PATCHING (PLAYBACK)

RECORDER OUTPUTS		TO	AMP/DELAY IN (1-4)
TRK 1 (A 33,34)	8 (H 33,34)		1 (B 31,32) _____
2 (B 33,34)	9 (J 33,34)		
3 (C 33,34)	10 (K 33,34)		2 (C 31,32) _____
4 (D 33,34)	11 (L 33,34)		
5 (E 33,34)	12 (M 33,34)		3 (D 31,32) _____
6 (F 33,34)	13 (N 33,34)		
7 (G 33,34)	14 (P 33,34)		4 (E 31,32) _____

AMP OUT	TO	4130 REF IN
1 (A 43,44)		1 (A 47,48)
2 (B 43,44)		2 (B 47,48)
3 (C 43,44)		3 (C 47,48)
4 (D 43,44)		4 (D 47,48)

DELAY OUT (4130 A OUT)	TO	4130 DATA IN	TO	SHORTING BAR	TO	DISC BANK DATA IN (1-8)	
1 (A 45,46)		1 (A 49,50)		_____		_____	_____
2 (B 45,46)		2 (B 49,50)		_____		_____	_____
3 (C 45,46)		3 (C 49,50)		_____		_____	_____
4 (D 45,46)		4 (D 49,50)		_____		_____	_____

4130 A/B OUT	TO	DISC BANK DATA IN (1-8)	
1 (J 43,44)		_____	_____
2 (K 43,44)		_____	_____
3 (L 43,44)		_____	_____
4 (M 43,44)		_____	_____

4130 TSC OUT	TO	DISC BANK TSC IN (1-8)	
1 (J 45,46)		_____	_____
2 (K 45,46)		_____	_____
3 (L 45,46)		_____	_____
4 (M 45,46)		_____	_____

DISCRIMINATOR BANK COORDINATES

DATA IN	TSC IN
1. S 43,44	1. S 45,46
2. T 43,44	2. T 45,46
3. U 43,44	3. U 45,46
4. V 43,44	4. V 45,46
5. W 43,44	5. W 45,46
6. X 43,44	6. X 45,46
7. Y 43,44	7. Y 45,46
8. Z 43,44	8. Z 45,46

7.3 Patchboard Che kout and Debugging

7.3.1 Use the patchboard and FM patching forms to double check patching.

7.3.2 Load the RT11 diagnostic Disk into Disk Drive 2 and run the program EVCHV (Encoder Channel Verify). Refer to Section 3.0 for details on setting this up.

7.3.3 After the program EVCHV is running, use the patchboard form previously filled out for the patchboard to be verified, as a checklist of the ADC channels being used.

7.3.4 Enter the ADC number to be verified on the keyboard. (Note: the ADC number must be in octal format). The ADC number will be displayed as an address on the front panel of the 714 data compressor.

7.3.5 The data (signal) for the chosen ADC will be displayed as data on the 714 front panel. As the patch source voltage is varied or disconnected. Note the appropriate change in the data display. If no change is noted, trace the patching and remedy the problem.

7.3.6 Repeat the above steps for the remaining ADC channels to be verified. This should be a helpful means of verifying a large portion of any patchboard.

7.4 Patchboard Listing

MOD0

MOD0.PB2 - For realtime Plumbrook runs.

MOD0.PB3 - Playback of Plumbrook tapes for dates listed in data base ID

MOD0.PB4 - Used for realtime runs at Plumbrook from dates listed in MOD0.PB4 program ID.

MOD0.VAN - Mod0 weather vaning playback.

MD0.PBB - Playback for the Plumbrook WTG, January, 1982.

Plumbrook Calibration - Calibration board.

MOD0 Brush Playback - Brush playback.

MOD0A

MOD0A.CL - For playback of Sair analog tapes from Clayton, New Mexico.

MOD0A.BI - For playback of Sair analog tapes from Block Island, R.I.

BI.FUEL - For playback of Block Island fuel study tapes.

MOD0A.PR - For playback of Sair analog tapes from Culebra, Puerto Rico.

MOD0A.HA - For playback of Sair analog tapes from Hawaii.

MOD2.GH2 - For playback of WTG 2 tapes from Goldendale, Washington.

MD2A.GH3 - For playback of WTG's 2 & 3 from Goldendale, Washington, 1981.

MD2B.GH2 - For playback of WTG 2 from Goldendale, Washington.

MD2B.GH3 - For playback of WTG 3 from Goldendale, Washington.

MOD2

MOD2.WA1 - Same as program ID.

MD2D.GH2 - Same as program ID.

MD2E.GH3 - Same as program ID.

MOD4

MEDI.BOW - Same as program ID.

MEDI.BWW - Same as program ID.

BENDIX

Palm Springs - For playback of tapes from Bendix WTG, Palm Springs, Ca.

8.0 Related Documents

This operations manual does not contain complete operation and maintenance instructions for the equipment of the Data Acquisition System. Additional documents that are required are listed as follows:

Model 609-19-0-0-E6942 Multiplexer/Encoder Assembly, Instruction Manual

Model 714 Data Compressor, Instruction Manual

Data RAM Corporation DR-103 Core Memory System Technical Manual

Model 741 Time Code Generator/Translator, Instruction Manual

Model 2763 Buffered Data Channel, Instruction Manual

Model 2765 Priority Interrupt, Instruction Manual

Sabre VII Magnetic Tape Technical Manual

Sabre III Magnetic Tape Technical Manual

EMR 4167 Subcarrier Discriminator Technical Manual

EMR 4150 Subcarrier Discriminator Technical Manual

Dec LA 36 Dec Writer Operations Manual

Dec 11/34 Manuals - Technical and Operations

Dec Magtape TE16 Operations Manual

RSX-11 Utilities Procedures Manual

RSX-11M Televent Programmer's Guide

RSX-11M Televent Operator's Manual

EMR 379-01 Remote Multiplexer Unit Manual